# PUBLIC WORKS Magazine

**Founded in 1896**

***Devoted to the interests of the engineers and technical officials of cities, counties and states***

**Vol. 78, No. 6**

**W. A. HARDENBERGH and A. PRESCOTT FOLWELL**
***Editors***


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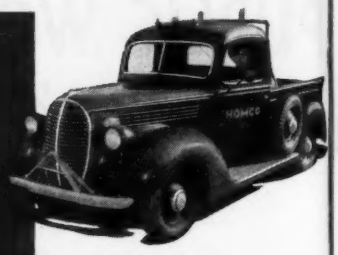

*Two 1939 Ford Trucks owned by HOMCO that prove the point: (Above) Driver Joe Zachary and Pickup, mileage 207,316; (Below) Driver H. C. Carpenter and Pickup, mileage 228,33[illegible]. Supt. Littlepage adds: "Our Ford Trucks deliver trouble-free miles at minimum cost!"*

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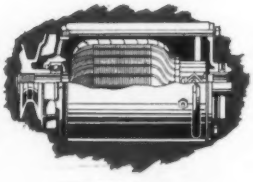
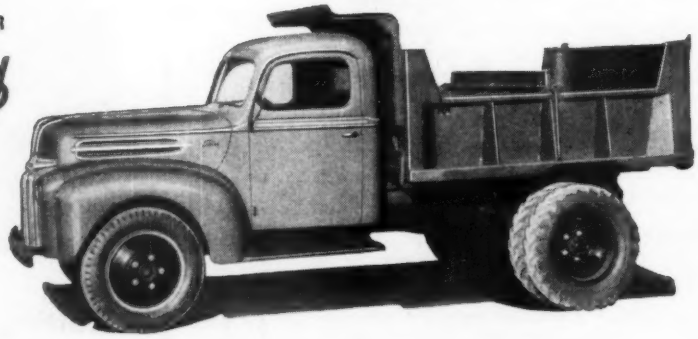


The fame of Ford Trucks for swift, sure starting and all-weather reliability rests solidly on Ford design and Ford quality . . . in particular, the Ford Electrical System. More than 12 million Ford-designed starter motors and generators have been built in Ford shops. Repeated tests for electrical efficiency consistently prove these fine, Ford-built units to be outstanding. Long, trouble-free generator service is assured by such long-life features as pre-lubricated, sealed ball bearings on armature shafts, and by bushings wick-lubricated from a reservoir with an overflow drain, which prevents surplus oil from reaching commutator. Ford starter motors are pre-lubricated, requiring no oiling whatever. Ford wiring and generous battery and generator capacity adhere strictly to the highest standards of the industry. The simplicity and high efficiency of the Ford starting system circuit, too, have much to do with Ford's faithful starting performance.

Ford

THE 6 YOUR PICK OF POWER THE V-8



*Hauling bulk building and street construction materials, the Ford Dump Truck chassis provides capacity, maneuverability and long life that have made it a prime favorite everywhere. This shows an 8-foot-long center-gate Dump body for "balance work," by Anthony Company, Streator, Illinois.*

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# The Editor's Page

## Translating New Equipment Into Completed Work

Engineers should study all new equipment that is developed, and most of them do a fair job in this respect; but familiarity with new equipment is not enough. Construction is the payoff; the engineer must so saturate himself with the possibilities of this new equipment that he can visualize its part in the assembly-line production of the projects to be constructed. This means that he must study the possibilities of designing and planning these projects, so as to insure, so far as possible within the limits of good design, that construction will be as nearly streamlined as possible.

With a few notable exceptions, engineers in the public works field have not taken full advantage of mechanization. Handwork has been largely done away with —dirt is no longer handled by men with picks and shovels—but the various steps in construction, though individually mechanized, have not been coordinated into a truly mass-production or assembly-line basis.

Granting the difficulties in doing this, it is still not impossible; and it is one of the developments that could give our communities the facilities for better living that they now need but feel too often that they cannot afford. Imagination is needed, just as it was in the automobile and airplane industries where the manufacturing process had to be adapted from the stage that public works engineers are now in to assembly line-production. After initial engineering design, the various procedures necessary in public works construction must be analyzed and, where possible and necessary, regrouped. This will be pioneering work; there is little to go on. A few dreamers may be necessary—those strange men who don't know that it can't be done.

## Planned Parsimony vs an Unbalanced Budget

Neither planned parsimony nor an unbalanced budget is desirable for a city, a county or a state. But of the two, the latter may sometimes be preferable. There is too much at stake to risk a continuous policy of parsimony. Our streets and highways represent, not only an investment that depreciates with astonishing rapidity if not properly cared for, but also facilities that are necessary for the flow of business. Our water works and sewerage installations are municipal necessities, affecting directly health, welfare and property values. Snow removal is a thing that northern cities have to be prepared for; refuse disposal is a year-around, country-wide problem.

Unfortunately, the nearsighted parsimonist in government too often takes advantage of the fact that most of these facilities, with good luck, may get by just one more year. The fact is that the assets of our cities, counties and states, as represented by our community investments—whether streets, highways, sewers, sewage or water treatment plants, water piping, incinerators and equipment—ought to be treated in the same way as the assets of any business. They ought to be made to produce the greatest returns possible to the people of the community, for the only reason for their being is the service they can render.

If it takes an unbalanced budget to bring our community facilities to a point where they can render the service they are designed for, or to conserve the investment in them, then we are all for the unbalanced budget.

## Effect of Shortages on Water and Sewerage Projects

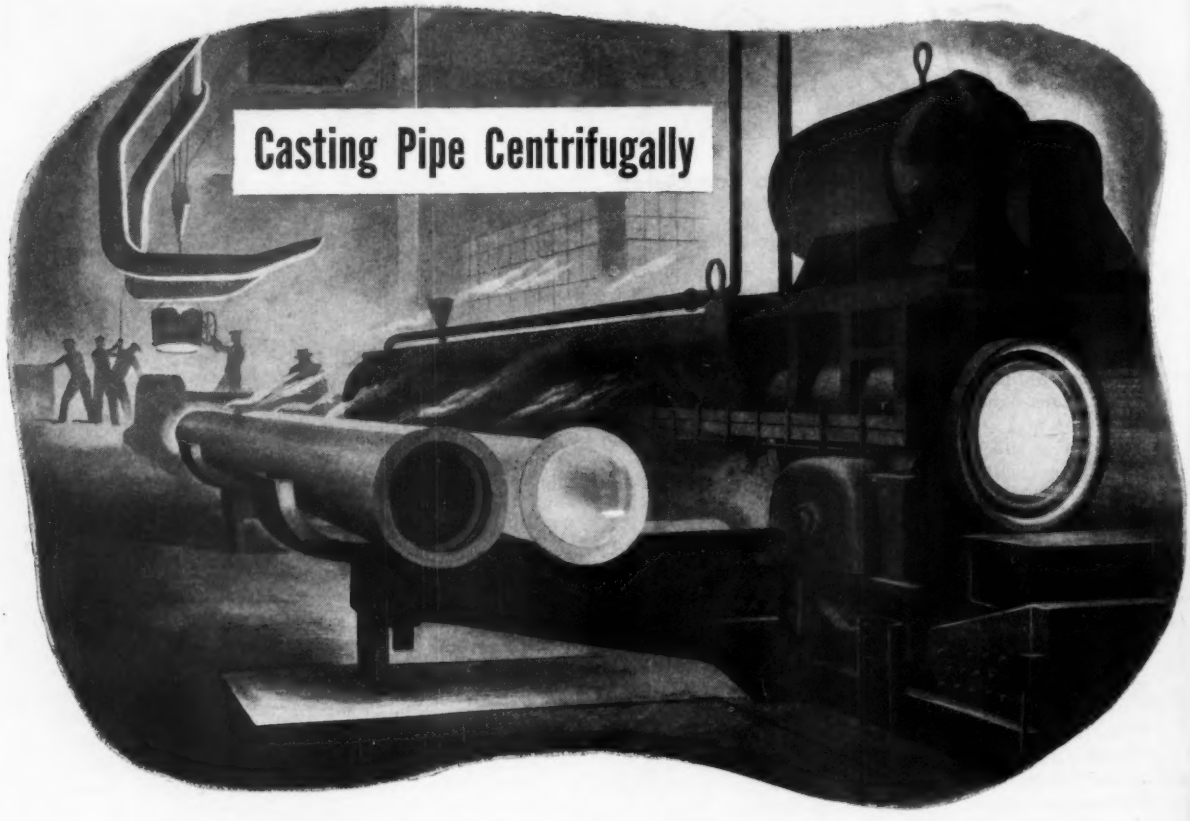
A limited review of water and sewerage projects completed or placed under construction in 1946, as compared with those for which plans and specifications have been approved and construction is presumably scheduled for 1947, shows the effect of material shortages in various lines. It also provides a sort of laurel wreath for the manufacturers of chlorinating equipment who, it seems, have been as successful in converting promptly to peace-time needs as they were in meeting war-time demands.

About 5 or 6 times as many projects for water distribution systems or enlargements thereof are presumably scheduled for 1947 as were placed under construction in 1946; and 2 or 3 times as many water treatment plants. The ratio for sewerage is nearly the same—about twice as many sewerage systems planned as were put under construction in 1946; and 4 or 5 times as many sewage treatment plants.

## We Need Better Technical Meetings

Too many of the sessions at our technical meetings are pretty sad affairs. Speakers drone on, inaudible to many in the room, often speaking far over the heads and beyond the interests of their should-be hearers. A new idea has come out of Illinois, where at a sewage plant operator's conference a "See the Experts" session was featured. Fourteen operation and maintenance topics were selected and two or three experienced engineers or operators were chosen as "experts" for each topic. Each group of experts had a separate marked location so that any operator with a question could select the appropriate group, sit down with them and talk over his problem informally. This personalized help proved far superior to large-group discussion, where the moderately untrained operator finds it almost impossible to get a clear answer to his problem, assuming that he has the courage to ask it in the first place.

We need more new ideas for technical meetings; and we need a better handling of present methods. There should be specifications covering length and method of preparation of papers; notoriously poor speakers should be avoided or their papers should be read by someone else with ability in this line, with the author available to answer questions. Discussions should be held to the subject matter. Loud speakers should be available and should be properly used; and rooms with good acoustic properties should be selected as far as possible. A time limit on speakers should be established and enforced. Above all, though, we need more and better new ideas for our meetings.




THE great majority of cast iron pressure pipe produced today is cast centrifugally in metal or sand-lined molds. When this mechanized process was introduced 25 years ago, its potentialities for improved production controls were evident. For human fallibility was largely replaced by machine accuracy based on scientific principles.

The improved production controls made possible by the centrifugal casting process have long since been realized. Hundreds of millions of feet of centrifugally-cast-iron pressure pipe are now in service. All of this pipe is more uniform in metal structure, in wall thickness, and in concentricity, than pipe not centrifugally cast.

Better production control means better pipe; it results in greater uniformity of quality.

Production controls in cast iron pipe foundries start almost literally from the ground up with inspection, analysis and testing of raw materials; continue with constant control of cupola operation by metal analysis; and end with rigid tests of the finished product.

It must be obvious that this is vastly better pipe than cast iron pipe made by the rule-of-thumb methods of a century ago, even though most of that pipe is still in service.

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# IS SCREENING LIQUIDS YOUR PROBLEM?

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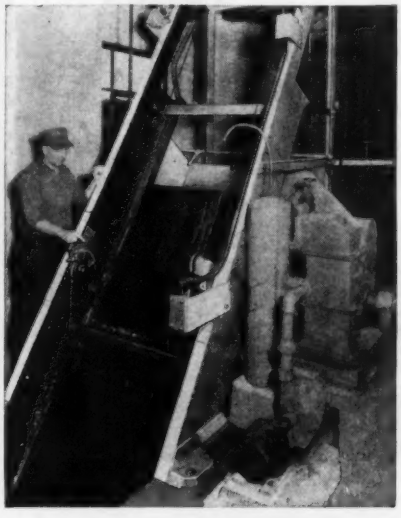
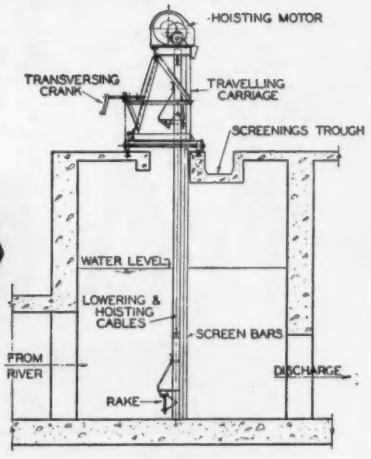


## TRASH SCREENS

—for the removal of large floating particles from large volumes of water, for the protection of fine water screens or other water plant or power plant equipment.




TRASH SCREEN WITH MECHANICAL RAKE

## STRAIGHTLINE SCREENS

—for the removal of solids over ½ inch size from sewage or industrial liquids.

## TRITOR SCREENS

—for the removal of both grit and floating solids or other detritus from waste waters.

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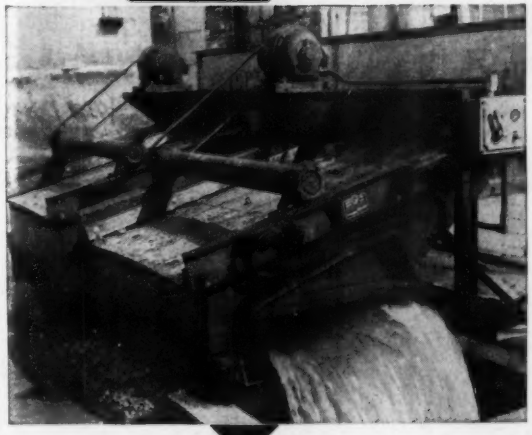

—for the removal of fine solids from industrial liquids.

In addition to screens, Link-Belt Company manufactures a complete line of equipment for water, sewage and industrial waste treatment such as Straightline and Circuline sludge collectors, grit collectors and washers, mixers, scum breakers, aerators, dryers, power transmitting, elevating and conveying machinery. Send for catalogs.

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The engine has given more than 25,000 hours of service at one-third the cost of operating with purchased electric power. Depreciation of the engine as well as charges for standby electric service are included in the costs of operation.

International Power really pays for itself here! Ask the International Industrial Distributor near you to help select the International engines, power units, tractors and matched equipment for your community's use.

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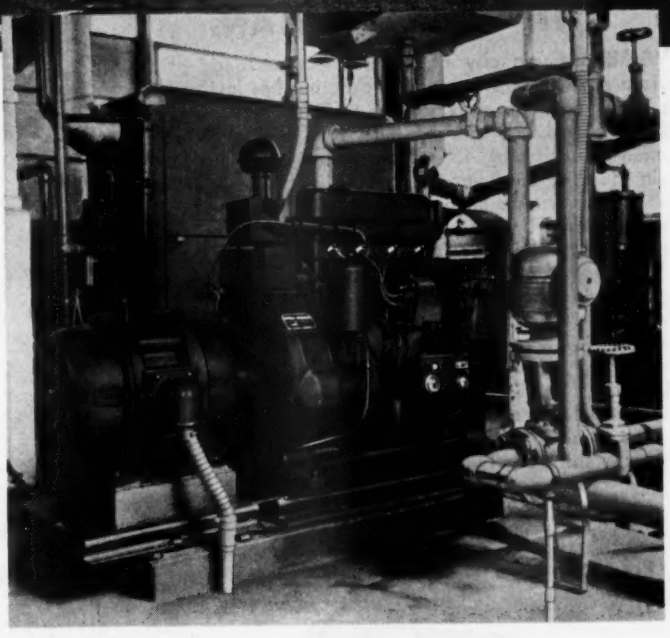

INTERNATIONAL HARVESTER

Exhaust gas of this International U-4 engine heats water for one of the processes of sewage treatment while its generator supplies power for sludge pumps and other power applications. The cooling system is connected to heat-exchangers for water heating and to heat the main building in winter. Hourly cost for all maintenance, depreciation, lubrication and electric standby service, based on hours used, is $0.0639.

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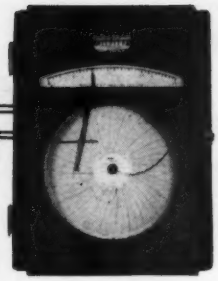

Builders Flo-Watch Meter

# *Flo-watch* METER

## WATCHES FLOW *Mechanically*

### TOTALIZES • INDICATES • RECORDS

One rugged and simple mechanical instrument, — Builders Flo-Watch Meter — located on the control panel, provides complete flow information over distances up to 100 feet. The Flo-Watch Meter totalizes, indicates, and records all flow of liquid, air or gas over a range of from 10% to 100% of rated capacity. The seven-figure counter is direct reading, i.e., shows gallons, pounds, etc., without odd multipliers. Uniform graduations and exceptionally large scale permit the indicator to be read from a distance. The twelve-inch recording chart has uniformly spaced graduations over the entire flow range and is available in any units of flow.

Only two small pressure tubes are required to connect the Flo-Watch to any differential producer — Venturi Tube, Nozzle or Orifice. The Builders Venturi Insert Flow Nozzle shown with the Flo-Watch provides economical yet accurate metering . . . the Flo-Watch Instrument, actuated by changes in the mercury level in its U-tube wells, responds within 1% to variations in flow through the Nozzle. The Insert Nozzle is mounted between standard pipe flanges, with pressure piping connected to the mounting flange. It is unnecessary to drill the pipe-wall or flanges, which greatly simplifies correct installation.

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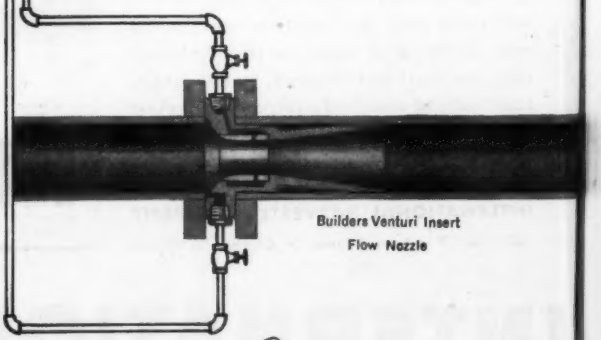
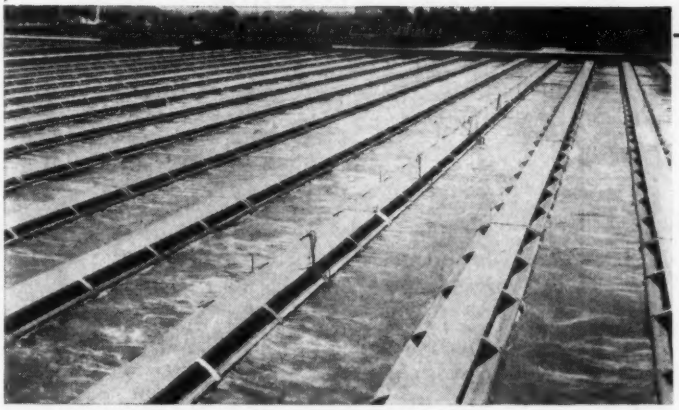


Builders Venturi Insert Flow Nozzle

BUILDERS PROVIDENCE *Instruments*

# Performance in World's Largest Sewage Treatment Plant...

## ...leads to extended use of Everdur Electrical Conduit



*Everdur Electrical Conduit serves the aeration and final settling tanks in bringing power from the operating galleries to the sluice gates at the control centers, and from these centers to the operating mechanism on the center pier of each tank.*

*General view of Southwest Sewage Treatment Works, Chicago, world's largest sewage plant.*

*Electrical tunnel, showing Everdur Electrical Conduit in course of installation. In all, 14 miles of such conduit were required.*

WHEN Chicago's Southwest Sewage Treatment Plant was built ten years ago, a total of 14 miles of Everdur* Electrical Conduit, in sizes from ¾" to 2½", was installed... about 80,000 lb. of conduit and 20,000 lb. of fittings and boxes.

Conduit of Everdur Metal was selected because of its high physical properties and excellent resistance to many corroding agents. Today this Everdur Conduit is still giving excellent service where rustable conduit has failed. Additional Everdur Conduit is now being installed.

For detailed information on Everdur Copper-Silicon Alloys in Sewage and Water Works service, write for Publications E-11 and E-5. 46192-Rev.

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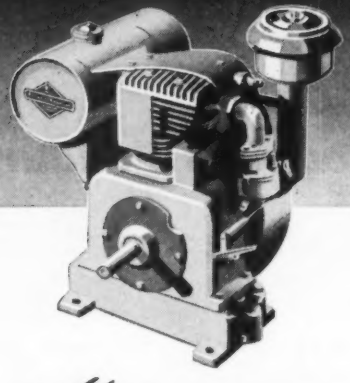

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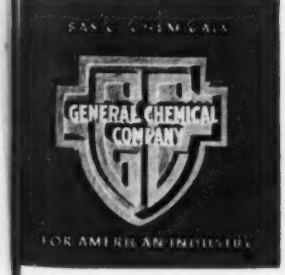
| PRODUCT | AVAILABLE FORMS | COMMERCIAL STRENGTH (MIN.) | SHIPPING CONTAINERS | APPLICATIONS |
|---|---|---|---|---|
| **Aluminum Sulfate** $Al_2(SO_4)_3 \cdot 14H_2O$ approx. *(Filter Alum)* | Commercial & Iron Free: Lump • Ground Powdered | 17.25% $Al_2O_3$ | Bags Barrels • Drums Bulk Carloads | Coagulant for water and sewage. Dewatering conditioner for sewage sludge. 1% Sol. pH 3.4. |
| **Aqua Ammonia** $NH_4OH$ plus Water *(Ammonia Water)* | Colorless Liquid | 26° Be. (29.4% $NH_3$) | Steel Drums Carboys | Used with chlorine to form chloramines for water disinfection. |
| **Ammonium Aluminum Sulfate** $Al_2(SO_4)_3 \cdot (NH_4)_2SO_4 \cdot 24H_2O$ *(Ammonia Alum) (Crystal Alum)* | Lump Nut Granular Powdered | 11.2% $Al_2O_3$ | Bags Fibre Drums | Coagulant for water. Advantageous for pressure filters. Supplies ammonia for chloramine formation. 1% Sol. pH 3.5. |
| **Sodium Bisulfite, Anhydrous** $Na_2S_2O_5$ *(ABS) (Sodium Metabisulfite)* | Powdered | 97.5% $Na_2S_2O_5$ (Equiv. 65.5% $SO_2$) | Fibre Drums | Antichlor. Remove iron and manganese deposits from filter sand. 1% Sol. pH 4.6. |
| **Sodium Silicate** $Na_2O \cdot X(SiO_2)$ plus $H_2O$ *(Water Glass) (Silicate of Soda)* | Viscous Liquid | 38° to 52° Be. Various Ratios of $Na_2O:SiO_2$ | Drums Tank Cars Tank Trucks | 1. Aid in floc formation. 2. Prevent red water corrosion in distribution lines. 1% Sol. pH 12.7 |
| **Sodium Thiosulfate** $Na_2S_2O_3 \cdot 5H_2O$ *(Hypo) (Sodium Hyposulfite)* | Crystals: Prismatic Rice Selected Universal Granular | 99.75% $Na_2S_2O_3 \cdot 5H_2O$ | Bags Barrels Fibre Drums | Antichlor. Water solution is neutral. |
| **Sulfuric Acid** $H_2SO_4$ plus $H_2O$ *(Oil of Vitriol)* | Corrosive, oily liquid Various strengths | 66° Be. (93.19% $H_2SO_4$) | Bottles Carboys Drums Tank Trucks Tank Cars | 1. Reduce pH and alkalinity. 2. Regenerate carbaceous zeolites and ion exchangers. 3. Activate Baylis Silicate. |
| **Potassium Aluminum Sulfate** $Al_2(SO_4)_3 \cdot K_2SO_4 \cdot 24H_2O$ *(Potash Alum)* | Lump Nut Granular Powdered | 10.7% $Al_2O_3$ | Bags Fibre Drums | Coagulant for water. Slow, even rate of solubility desirable for solution pot feeders. 1% Sol. pH 3.52. |
| **Sodium Sulfite, Anhydrous** $Na_2SO_3$ *("Sulfite")* | Granular Powdered | 98.5% $Na_2SO_3$ | Bags Fibre Drums | Antichlor, oxygen remover. Weak solutions absorb oxygen readily. 1% Sol. pH 9.8. |
| **Sodium Sulfate, Crystal** $Na_2SO_4 \cdot 10H_2O$ *(Glauber's Salt)* | Crystal & Needle Crystal | 96% $Na_2SO_4 \cdot 10H_2O$ | Barrels Bags Drums | Neutral Solution. Boiler water treatment (maintenance of sulfate-carbonate ratio). |
| **Sodium Sulfate, Anhydrous** $Na_2SO_4$ | Powdered | 99.5% $Na_2SO_4$ | Bags Barrels | Neutral Solution. Boiler water treatment (sulfate-carbonate ratio) |
| **Trisodium Phosphate** $Na_3PO_4 \cdot 12H_2O$ *(TSP)* | Crystal | 98.5—103% $Na_3PO_4 \cdot 12H_2O$ (Equiv. 19% $P_2O_5$) | Bags Barrels Fibre Drums | Boiler water treatment. Cleaning compound. 1% Sol. pH 11.8-12.0. |
| **Disodium Phosphate, Crystal** $Na_2HPO_4 \cdot 12H_2O$ | Crystal | 98% $Na_2HPO_4 \cdot 12H_2O$ (Equiv. 19.5% $P_2O_5$) | Bags Barrels Fibre Drums | Boiler water. (Calcium and magnesium precipitation.) 1% Sol. pH 8.4. |
| **Disodium Phosphate, Anhydrous** $Na_2HPO_4$ | Powdered Flake | 96% $Na_2HPO_4$ (Equiv. 48% $P_2O_5$) | Same | Same as Crystal, but stronger product. |
| **Sodium Fluoride** NaF *(Fluoride)* | Powdered (white or blue colored: Nile Blue) Light or dense | 90% and 95% NaF | Bags Barrels Fibre Drums | Fluorination of water supplies. (For information, consult with local health officers.) |

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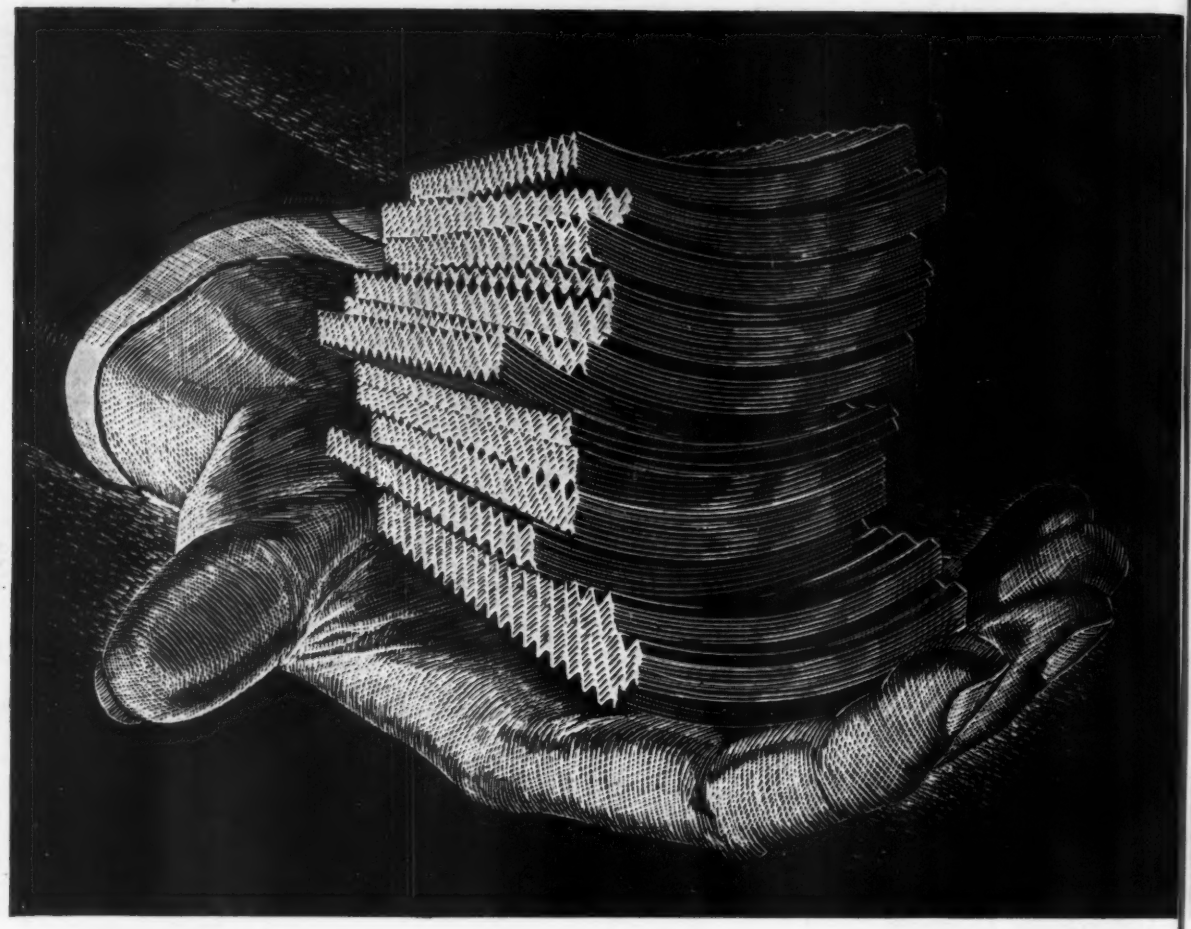

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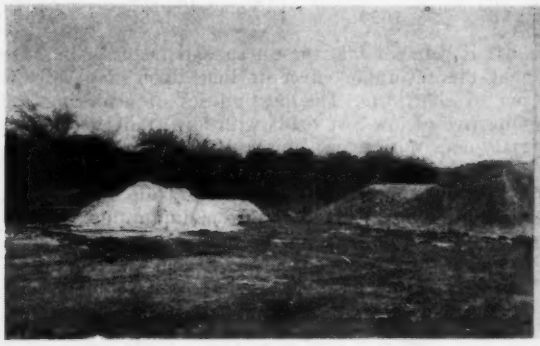

Fig. 2. Lime and base material stockpiled.

Fig. 3. Mixing and loading materials.

# Lime Treatment Permits Use of Substandard Flexible Base Materials

**How lime has been used to treat highly plastic subgrade soils to increase stability and water repellency sufficiently for use as bases; and to improve other borderline base materials.**

By B. B. FREEBOROUGH
Engineer, Land Service Road Division, Texas Highway Dept.

ONE of the least advertised of our natural resources is the supply of local road base materials of suitable quality. Availability of these materials within economic haul distances is a major factor in the ultimate cost of a road, including initial construction, reconstruction, and maintenance. Therefore, the rapidly diminishing supply of high-grade flexible base materials in many localities is a matter of concern to highway engineers. The seriousness of this condition becomes apparent when it is realized that in some areas where an average haul of four miles or less prevailed about twenty years ago, it is now necessary to haul similar materials for distances of ten or more miles. In a great many instances the item of flexible base haul which formerly represented only 25% or 30% of the flexible base cost, now represents from 55% to 60%.

Fig. 1. Surface treatment failure due to poor base and heavy traffic.

Quests for suitable materials in later years have also made serious inroads upon the available supply of medium grade materials. Consequently, the engineer is confronted with the problem of providing needed road improvements with sub-standard materials or materials which had previously been passed up as undesirable. What are the possibilities of utilizing these materials successfully? In what manner may they be used and to what extent? What treatment is necessary to avoid subsequent failures? These are questions of obvious economic importance and they have directed the thoughts of a number of Texas highway engineers in recent years.

### *Admixes to Improve Base Materials*

Sands, clays, cements, asphalts, and oils have been used in conjunction with poor quality local base materials and each has proven its usefulness within certain limitations. Of these admixing agents, only sand has proven successful in the treatment of highly plastic clay soils. As a rule sand is not readily available in black-land areas and the amount of sand usually necessary to stabilize highly plastic soils makes the cost of importation prohibitive. Within the individual limitations, the ultimate selection of an admixing agent is usually a matter of cost.

In an effort to correct the unsatisfactory conditions caused by the presence of highly plastic materials in flexible bases, several Texas engineers have revived

the use of lime. Initially, the experiments consisted of mixing waste lime from a nearby kiln with the existing flexible base materials in an effort to correct asphalt pavement failures. The results were highly satisfactory. Starting thus as a purely maintenance operation, these experiments have been and are still being expanded to include new construction projects. The full extent of the possibilities of the use of lime are still unknown. The results thus far, however, very definitely prove that there is a place for lime among our other proven roadbuilding materials.

### Problems with Highly Plastic Clays

Cement and asphalts are usually considered to be excellent stabilization admixes. In order successfully to use these admixes, however, it is most essential that the soil to be stabilized is thoroughly pulverized. If it is not, a uniform and complete mixture of soil and admix is not obtained and the resulting attempt at stabilization will not be successful. It does not appear practical to obtain the degree of pulverization necessary, in the case of highly plastic clay soils, by mechanical methods. This is especially true where limited finances dictate a rigid economy. From experiments conducted in Texas, it has been found that an admixture of lime will greatly facilitate the pulverization of these clay soils. There is nothing strange about this. Agricultural usage of lime for many, many years has thoroughly proven its pulverizing or mulching value. It would follow therefore, that an admixture of lime may be used to an economical advantage in the preparatory treatment of clay soils which will permit their stabilization with either cement or asphalt.

The application of lime to highly plastic soils has a material and very beneficial effect upon the soil constants. The following is a summary of the averages obtained from a number of widely scattered tests.

| Treatment | Average LL | Average PI | Average LS |
|---|---|---|---|
| Untreated material | 80 | 52 | 25 |
| with 4% of lime | 56 | 20 | 13 |
| with 8% of lime | 49 | 12 | 8 |

These tests clearly indicate that the stability of highly plastic clays is appreciably increased when an admixture of lime is used. In one instance, molded specimens of a black waxy soil treated with 5% and 8% of lime were kept in a capillary tank with ring standing on edge thus subjecting them to a 100% humid condition. After four and a half years in the capillary tank the specimens had formed a rather dry surface. Modified bearing values of the two mixtures at various intervals were found as follows:

| | Modified bearing value (p.s.i.) | | | |
|---|---|---|---|---|
| *Percent lime* | *1 day* | *7 days* | *20 days* | *4 years 5 mos.* |
| 0 | 95 | 75 | 75 | 140 |
| 5 | 775 | 1125 | 1300 | 1340 |
| 8 | 1050 | 1335 | 1665 | 4760 |

It is believed that these tests satisfactorily indicate that the favorable effect of lime upon clay soils is not of short life. The possibilities of achieving the objective of low-cost roads with low-grade base materials does not appear quite so far-fetched.

It is a well known fact that clay soils maintained at the optimum moisture content provide an excellent foundation. Were it practical to maintain this moisture content under normal conditions, our present difficulties with these soils would not exist. Unfortunately, as the moisture content is increased, stability decreases and successive stages of drying and saturation create a highly unsatisfactory condition not only in roads but also in structural foundations. Studies with various clay soils indicate that an admixture of lime has a tendency to make these soils water-repellent. In a number of instances, clay soils which would normally absorb from 25% to 30% of moisture in seven days have been found to absorb only 4% to 7% of moisture in the same period and under the same conditions after they had been treated with as low as 2% of lime. Consequently, it would appear that an admixture of lime to highly plastic clay soils is but a step in the direction of stability through maintenance of proper moisture content.

Although the experiments treated thus far have been confined to the effect of lime on highly plastic clay soils, like results have been obtained in the treatment of other flexible base materials. The following is indicative of the radical reductions made in the plasticity index and the linear shrinkage of various flexible base materials when treated with nominal quantities of lime.

| Material | Untreated P.I. | Untreated L.S. | Lime treated % lime | Lime treated P.I. | Lime treated L.S. |
|---|---|---|---|---|---|
| Caliche | 17 | 6.5 | 2.5 | 9 | 4 |
| Disintegrated white and blue rock | 17.5 | 8.5 | 3.0 | 4.3 | 4 |
| Limestone gravel | 18 | 10 | 3.0 | 7.4 | 4.5 |
| Granite gravel | 19.8 | 9.5 | 3.0 | 7.5 | 4.7 |

Most of the experiments with lime, conducted in Texas thus far, have involved the use of waste lime which is usually obtainable from kilns at a very low cost. On a number of contract jobs, however, standard commercial hydrated lime was used. Either type of lime appears to produce the same results. On ac-

*(Continued on page 20)*

Fig. 4. Dumping premixed materials on the road.

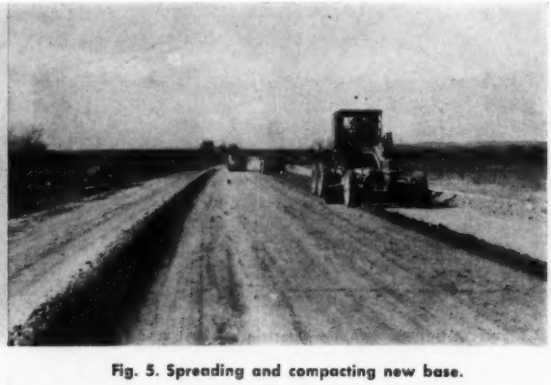

Fig. 5. Spreading and compacting new base.

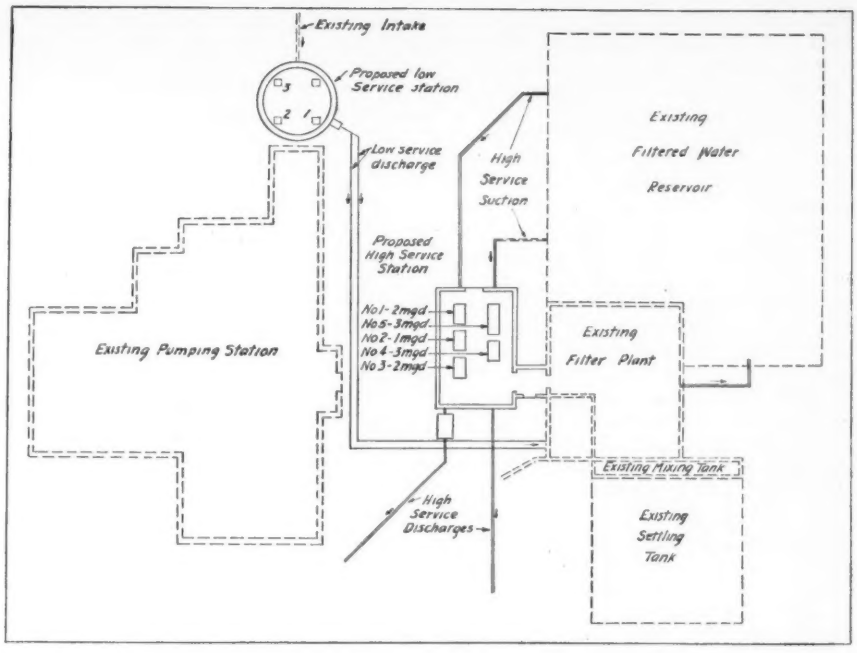


**Fig. 1. Layout of water works improvements at Alpena.**

# Modernizing a Pumping Station Saves Money

**Modernization of the Alpena pumping station estimated to save $2,563 per year; and with savings in labor will largely meet cost of improvements.**

**By H. F. FETTERS**
**Shoecraft, Drury and McNamee, Consulting Engineers**

ALPENA, MICHIGAN, located on Lake Huron, has a population of 13,000 which is supported by various enterprises including the manufacture of leather, paper and portland cement. The present municipally owned and operated water supply and distribution system dates from 1905, when the city started operation of a pumping station taking water from Lake Huron at a point 2,000 feet from shore. The water flowed to the pumps by gravity through a 40" steel intake line. During 1922 a filtration plant with a capacity of 3 mgd was added to the system, along with two steam turbine driven centrifugal low service pumps having a combined capacity of 6 mgd. In 1930 these pumps were equipped with electric motor drives and a third electrically driven pump of 3 mgd capacity installed.

As now operated the water flows by gravity from the lake through the intake line into the low service suction well at which point it is picked up by the low service pumps and delivered to the mixing tank, having been metered and dosed with alum in the low service discharge line. Following mixing the flow enters the settling tanks and thence passes through the rapid sand filters. Following filtration chlorine is added and the water allowed to pass into a ground storage reservoir of one million gallons capacity.

The present high service pumping equipment employed to deliver water from the ground storage reservoir into the distribution system consists of two reciprocating pumps driven by horizontal double cross-compound steam engines operating on 140 pounds steam pressure. Steam to operate the engines and to heat the pumping station and filtration plant is supplied by two 210 hp. and one 310 hp. coal fired boilers installed in 1905 and 1910.

During 1944, the city authorized Shoecraft, Drury and McNamee, consulting engineers of Ann Arbor, Michigan, to conduct a survey of the existing water supply and purification system and to submit a report of the findings including recommended improvements for strengthening the system and providing more

**Table I—Pumping Costs**

| Year | Mil. Gals. Filtered | Cost of Coal | Cost of Pumping | Labor Mtce., & Repairs | Total Cost | Cost Mg. Filtered |
|---|---|---|---|---|---|---|
| 1939 | 597.140 | $4,821 | $1,807 | $8,341 | $14,969 | $25.07 |
| 1940 | 586.332 | 4,923 | 1,546 | 9,535 | 16,004 | 27.30 |
| 1941 | 560.640 | 5,101 | 1,825 | 10,979 | 17,905 | 31.94 |
| 1942 | 538.375 | 5,621 | 1,981 | 10,522 | 18,124 | 33.66 |
| 1943 | 551.150 | 5,309 | 1.932 | 10,805 | 18,046 | 32.74 |
| Ave. | 566.727 | 5,155 | 1,818 | 10,036 | 17,010 | 30.14 |

**Table II—Filtration Costs**

| Year | Mil. Gals. Filtered | Cost of Chemicals | Labor, Mtce. & Supplies | Total Cost | Cost, Mg. Filtered |
|---|---|---|---|---|---|
| 1939 | 597.140 | $1,564 | $5,161 | $6,735 | $11.28 |
| 1940 | 586.332 | 1,646 | 6,574 | 8,220 | 14.02 |
| 1941 | 560.640 | 1,567 | 5,638 | 7,205 | 12.85 |
| 1942 | 538.375 | 1,365 | 7,814 | 9,179 | 17.05 |
| 1943 | 551.150 | 1,334 | 7,886 | 9,220 | 16.73 |
| Ave. | 566.727 | 1,495 | 6,617 | 8,112 | 14.39 |

efficient operation. During the survey an inventory was made of all existing elements of the supply and distribution systems. Operating records were also studied with special emphasis on the amount of water supplied to the distribution system and on the cost of filtration and pumping. A tabulation of these data for the five years from 1939 to 1943 inclusive is shown on Tables I and II for the pumping station and filtration plant respectively.

The age of the present high service pumping equipment and a comparison of the present cost of pumping with the estimated cost of providing and operating new electric high service pumps indicated the desirability of constructing a new high service pumping station. Other less extensive portions of the proposed construction include the installation of new turbine pumps in the present low service suction well, these to be housed in a masonry structure built over the present well; provision for a new chemical feed room and chlorine room in the existing filter building; and additional stand-by equipment.

The general layout of the proposed low service and high service pumping stations and the main runs of piping is shown in Fig. 1. Low service pumps Nos. 1 and 2 are motor driven and have a capacity of 1.5 and 3.0 mgd respectively; pump No. 3 is to be of 3.0 mgd capacity and is to be motor driven with a gasoline engine stand-by. High service pumps Nos. 1 to 4 are motor driven with No. 5 driven by a gas engine as a stand-by unit. Capacities of these pumps are as shown in Fig. 1.

At the present cost of electric power to the city it is estimated that water can be supplied to the distribution system at a cost of 5.4¢ per million gallons per foot of head. The present cost to the city for high service pumping only is just over 10.5¢ per million gallons per foot of head. At an average pumping rate of 1.7 mgd at the present pumping head of 81 feet this saving would amount to $2,563 per year. Together with the saving in labor which will be effected upon completion of the new station, this should largely meet the cost of providing the new service.

It is planned to make these improvements in the near future when the material and equipment markets are more favorable than at the present.

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## Lime Treatment of Base Materials

*(Continued from page 18)*

count of the fact that waste lime usually includes a considerable quantity of spalls, etc., a commercial grade of hydrated lime is more easily handled with a resulting reduction in waste. It is significant however to note that quality is not a prerequisite in this material. It would follow therefore, that a cheap grade of lime requiring less refinement than is usually found in commercial lime may effect further economies in the use of lime as an admix.

### *Advantages in Using Lime*

At present writing it appears that the probable advantageous use of lime will be about as follows:

(1) To treat highly plastic subgrade soils thereby increasing their stability and making them water-repellent. It is reasonable to assume that subgrade soils thus treated will require an absolute minimum of good quality flexible base materials in order to support an asphalt surface.

(2) To improve the quality of substandard or border-line flexible base materials to the extent necessary to make these materials capable of supporting an asphalt surface.

(3) To assist in the pulverization of clay soils in order that these soils may be stabilized with either cement or asphalt in the conventional manner.

(4) To stabilize completely highly plastic clay soils to the extent necessary to make these soils satisfactorily support an asphalt surface.

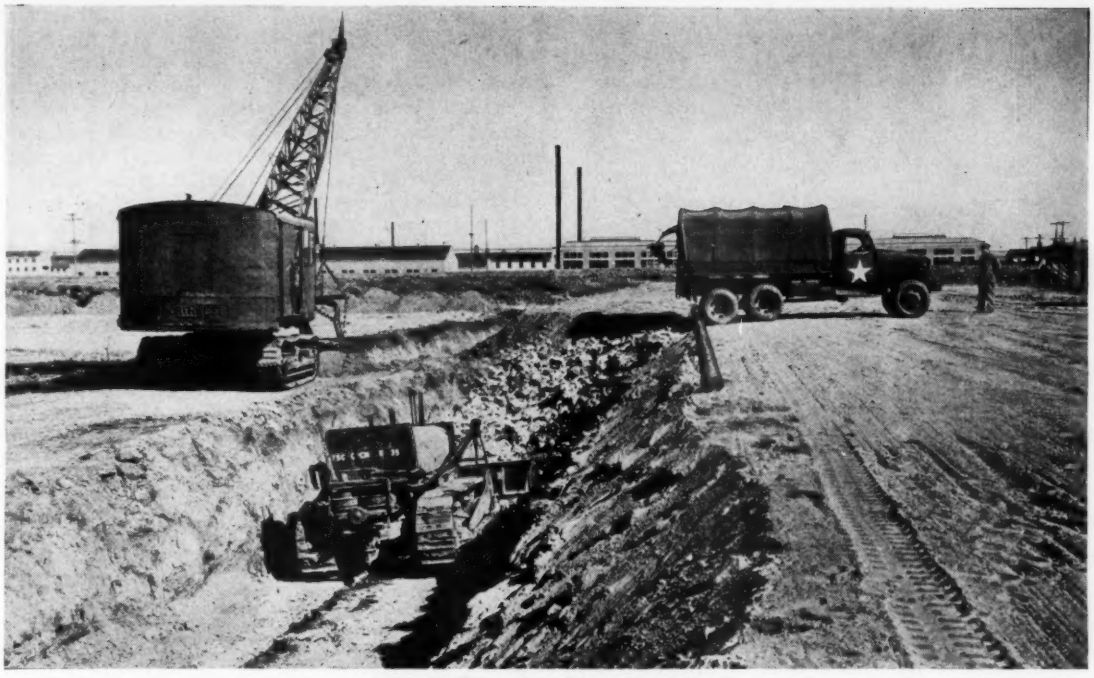
With these possibilities as a guide, the purpose for which the lime admix is used and the extent to which it is used will depend upon the economics of each individual case. The use of lime is not the answer to all of the engineer's problems. It is not an extremely cheap material. It will result in the construction of roads that are low-cost only when compared with conventional methods in areas of unsatisfactory soil conditions or areas in which high-grade flexible base materials are scarce. It must be admitted that the potentialities of lime are probably greater than I have dared to outline on the strength of the experiments thus far. More universal usage under more variable conditions will eventually reveal its full value. It is to the best interest of all highway engineers who have to face the problem of more mileage on less money to give full consideration to the merit of this material.

The accompanying pictures of an asphalt surface treatment in distress illustrate the procedures involved in lime treatment of flexible base failures. These are maintenance operations but the principles are much the same in either construction or maintenance. This road, Fig. 1, carried about 3,000 vehicles per day. The failures were due largely to the action of moisture on a flexible base, the soil binder of which had an LL of 36, a PI of 19, and an LS of 10. This soil binder constituted 37% of the flexible base. It was necessary to make repairs under traffic. In this instance, it was decided to mix 3" of treated flexible base with the upper layer of the existing base rather than merely to scarify and treat the existing base. On a fairly level part of the rights-of-way, the additional base material and waste lime were stockpiled as shown in Fig. 2.

The stockpile of base material was then levelled off and waste lime to the extent of about 3% by weight was added. The two materials were thoroughly mixed by a maintainer. In Fig. 3, the maintainer (in background) is mixing these materials while the loader is operating on the previously mixed batch. In normal practice, the pre-mixed materials are dumped on the asphalt surface as shown in Fig. 4, and levelled off and bladed into two windrows, one on either side of the surface treatment. The asphaltic surface and the upper three inches of the flexible base is then scarified, reshaped, and lightly rolled. Following this, the premixed materials are bladed in from each windrow in thin layers and thoroughly compacted by pneumatic tired and flat-wheel rollers. This operation is shown in Fig. 5.

Laboratory tests indicate that the new base material had an LL of 33, a PI of 5 and an LS of 3. Base repairs of this general type have been serving traffic very satisfactorily on this highway for over three years.

After construction, the new base was opened to traffic for about ten days (normally a week to ten days, depending on weather conditions) and a new bituminous surface treatment was then applied.



A sanitary fill at a large post in the mid-west

# Why the Army Favors Sanitary Fills for Refuse Disposal

**Experiences and practices with sanitary fills under war-time conditions in Army camps and establishments.**

By RODNEY R. DURHAM
Corps of Engineers

DURING the past four years the Army has generally recommended the installation of sanitary fills and over 60% of the posts in all parts of the United States use this method for the disposal of garbage and trash. Since there are many misconceptions regarding sanitary fills, some of which cannot be classified as sanitary, I will describe the operating procedure that the Army has established:

1. Garbage and refuse is dumped into a trench 10 to 15 wide.
2. Dumping is confined to a small portion of the trench.
3. Materials are thoroughly compacted and consolidated to fill a small section of the trench.
4. Each day the filled section of the trench is covered with two feet of compacted earth.
5. Twice a week the end of the filled section is covered to form a completely sealed cell.
6. Burning materials in the trench is prohibited.

Many people want to know why the Army favors sanitary fills. The answer is that for Army conditions they afford economy and efficiency of operation. These advantages best can be described by the nine factors listed below:

1. Sanitary fills have a low initial construction cost. Equipment can be purchased and the sanitary fill put into operation in the average camp for less than it costs to provide any other adequate means of disposal. The initial costs vary with the size of the camp; in large camps, sanitary fills cost proportionately less than in small ones.

2. Under military conditions, sanitary fills have a low operating expense. At large posts, sanitary fills are operated by two men, while at small installations only one man is used. Additional expenses over and above labor, include supplies and maintenance for the equipment. With other methods of disposal, there is also the expense of operating a dump for the disposal of non-combustible materials.

3. Sanitary fills are flexible, and large increases in the daily quantity of refuse are disposed of without large additional expense. This is a matter of considerable importance in the Army, where camp populations, unlike municipal populations, may vary greatly, without much notice.

4. Sanitary fills dispose of all types of refuse materials, thereby eliminating the need for segregation of materials and separate collections.

5. Correctly operated sanitary fills are not unsightly and do not create odors; therefore, they can be placed near the center of the camp, reducing the mileage required for hauling refuse to disposal points.

**Sanitary fill at one of the largest army posts.**

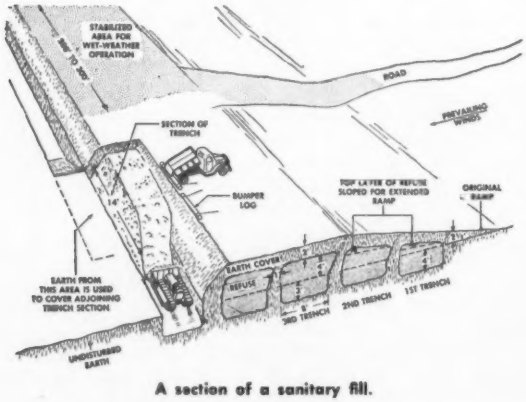
6. Sanitary fills raise the level of the ground and are used to reclaim low areas. Many acres of land have been reclaimed by this method at no expense other than the normal cost of refuse disposal.

7. Sanitary fills eliminate the need for operating an open dump and hundreds of old dumps at Army installations have been cleaned, covered and abandoned. Dumps used for garbage and trash disposal always provide breeding and harboring places for rodents, flies and mosquitoes, but not one sanitary fill in operation at an Army installation has created a problem of this nature.

8. Sanitary fills can be put into operation in a few days.

9. When a camp is deactivated, the sanitary fill equipment can be moved to another post.

The installation of sanitary fills saved the Army millions of dollars during the war. This method of disposal has been approved by the Surgeon General as a permanent method, and will be used in suitable locations during peacetime. These fills frequently have been located within 1,000 feet of hospitals, mess halls or barracks, with full consent of the post surgeon inasmuch as the sanitary factors are fully controlled.




**A section of a sanitary fill.**

The Army has been very successful in operating sanitary fills. This success is the direct result of thorough preliminary planning, sound engineering and proper supervision. All Army sanitary fills are installed by specially trained engineers: They select sites, supervise initial installation, train the operators, and make periodic inspections to insure that correct operating practices are being followed. The importance of selecting suitable sites, properly engineering the project and operating according to approved practices must not be underestimated, for without these essentials sanitary fills will not prove satisfactory.

## Mowing Highway Slopes With Tractor Mowers

A problem in roadside mowing that has come up in recent years in conjunction with the construction of depressed highways is that of mowing slopes. Previously where slopes were mowed at all, hand methods had been used, which in addition to being too expensive, were very unsatisfactory.

During the past year an experiment was made by Wayne County, Mich., in the use of tractor mowers on slopes that were not too steep. This method worked out very well and was gradually extended to include all slopes around depressed grade separations and other similar sections of roads. The work was done in dry seasons to minimize the danger of the tractor sliding, and on the steepest grades safety lines attached to another tractor operating on the level ground at the top of the slope were used.

A better job was accomplished than had ever been obtained with other methods. No accidents occurred and a considerable saving in costs was effected.

The control of weeds and mowing is a continuing problem each year between the months of May and October. Concrete highways are mowed the full width of the right-of-way including center parkways, and secondary roads are mowed to the ditch lines. Subdivision streets are mowed only once or twice during the year as is possible with the equipment available. Usually two shifts are employed on this operation in order to cover the vast mileage of roads.

## Promoting Growth of Grass Along Mississippi Highways

On all construction or maintenance work where the planting of grass, sodding or seeding is involved, engineers of the Mississippi Highway Department send in samples of the soil on which this work is to be done. These samples, which are based on the area involved, are forwarded to the laboratory in Jackson where tests are run to determine what elements are lacking in the soil as regards the growth of grass. From the results of these tests, the amount of fertilizers, or soil improvers, to be used and their character is determined. For instance, a stated number of tons per acre of agricultural limestone may be needed; commercial fertilizer, usually 6:8:4, is recommended at a rate depending on the soil needs, and nitrate of soda or ammonium nitrate may be added to give the grass an early push, murate of potash may be required to make the growth of grass thick and rapid. These necessary amounts are based on the need for making the grass stand equal to that in any pasture land. Reports from projects on which these methods have been used are highly favorable.

# Undersealing Pavements with Asphalt

By HUGH A. WALLACE

District Engineer, The Asphalt Institute, Dallas, Texas

EXPERIMENTAL sections of concrete pavement, on asphalt membranes, were built by the Texas Highway Department about 10 years ago. The asphalt cement was applied on the subgrade at 1 to 1½ gallons per sq. yd.; in some instances it was lightly sanded. The membrane material was low melting point paving asphalt, 50-60 or 85-100 penetration. On these experimental jobs, a large amount of extrusion occurred at joints and cracks during the first warm season, gradually diminishing during following seasons. Judging by the amount of material that has extruded, the membrane at or near joints and cracks is believed to be very thin.

Results obtained in Ohio with a high melting point asphalt influenced the Dallas District of the Texas Highway Department to begin using the Ohio method of subsealing on some of its badly broken and pumping pavement, but in doing this they expanded the scope of work to include the entire pavement. Late in 1944 the maintenance forces subsealed several miles of concrete. This proved very successful in stabilizing rocking slabs, filling cavities, regaining uniform subgrade support, sealing out surface water, and assuring a lower and more uniform moisture content of the subgrade, minimizing further movement of the pavement.

### *Unit Prices Materially Reduced*

In the belief that subsealing could be performed more cheaply by contract than by state maintenance forces, one small project was advertised for bids in May 1945. This project, 4.0 miles in length, was awarded on the following quantities and unit prices: 4,329 holes @ 33¢ each and 48,316 gallons of asphalt @ 14.7¢ per gallon. Adding the cost of drilling holes to the cost of the asphalt made the asphalt cost 17.6¢ per gallon in place. This price was slightly higher than recent previous maintenance costs.

In August 1945, 41.7 miles involving 65,258 holes and 822,795 gallons of asphalt, were awarded on the low bid of 23¢ each for holes and 12.25¢ per gallon for asphalt. Bidding on subsequent projects became very competitive. A large job, estimated at 93,630 holes and 1,404,130 gallons of asphalt, was awarded in November, 1946, at 4.9¢ each for holes and 9.33¢ per gallon for asphalt. Another project estimated to use 29,385 holes and 693,832 gallons of asphalt was awarded the following month at 4¢ each for holes and 10.6¢ per gallon for asphalt.

The average unit prices of the past few months are 5¢ each for drilling the 1½" holes and 11¢ per gallon for the asphalt in place. Contracts have been awarded on 459 miles of Texas highways and by using final quantities on 18 completed projects and estimated quantities on 5 incomplete projects, the 459 miles average 1504 holes per mile and 25,800 gallons of asphalt per mile. The majority of this mileage is 18' width pavement and the average cost of continuous subsealing, exclusive of engineering, is $2,914 per mile. Sixteen contracts awarded prior to August 1946 greatly overran the estimated quantities of asphalt. However, those who have had considerable experience in this work can generally estimate within 10% the amount of asphalt required.

The condition of the pavement, the type of subgrade and probable moisture content of the subgrade, will have considerable bearing on the amount of asphalt that will be required to obtain a satisfactory underseal. The membrane should have a minimum thickness of ¼", and 1½ gallons per sq. yd. is necessary to obtain that thickness. Additional asphalt, to fill cavities and regain uniform subgrade support, usually amounts to approximately 1 gallon per sq. yd. Therefore, approximately 2½ gallons per sq. yd. is necessary to obtain a satisfactory underseal for the average pavement.

### *Construction Methods Standardized*

Construction methods employed by contractors specializing in subsealing have become well standardized. Drilling equipment which can be adjusted to fit a range of hole patterns has been devised so that one operator can handle the equipment and drill 3 holes at the same time. By mounting air-lift drills on either side of a wheel type tractor and placing the third drill to the rear of the tractor, one man can drive the tractor which pulls a 210 cu. ft. air compressor and operate any one or all drills from the driver's seat. This arrangement for drilling the holes is responsible for lowering the price of holes from 23¢ to 4¢. Such equipment averages drilling 220 holes per hour.

The usual hole pattern for each traffic lane at joints and large cracks is one hole on the near side at about the quarter point of the pavement and 18" to 24" from the joint or crack and two holes beyond the joint or crack. With smaller cracks only 2 holes are used, one on either side. Generally one hole for each 10 sq. yds. of pavement is sufficient, but as the cost of holes is small, many holes are drilled that are not needed. These extra holes are considered as inspection holes and furnish some assurance of the spread of asphalt underneath the pavement. If, while pumping in one hole, asphalt comes up with some force through an adjacent hole, that hole is plugged and pumping is continued until the inspector is satisfied with the area treated. About 50% to 65% of the holes drilled are actually pumped.

Pumping equipment for one crew usually consists of 2 asphalt distributors or tank trucks equipped with motor and gear pump, 2 circulating type car heaters, one tractor for moving tank cars and heaters and a light utility truck for hauling water and cold mixed asphaltic concrete for sealing holes. If two pumping crews are operating on a job at the same time, the above equipment is supplemented with 2 distributors and one tank car heater.

The asphalt is loaded into insulated tank cars at the refinery at or near 500° F and if delivered at the

destination within 72 to 90 hours, the material in the top of the car will be liquid and can be circulated immediately. The temperature in the upper part of the cars usually ranges from 300° F to 400° F upon arrival.

All tank cars are circulated and unloaded by 4" flexible metal hose inserted through the dome of the car. By placing the intake and outlet circulating hose through the dome of the car, it is possible to start circulating and raising the temperature of the material within less than 5 minutes after the tank car is spotted. Unloading through the dome eliminates having to thaw the valve at the bottom of the car. As the temperature of the material is raised, the intake hose is gradually lowered until it is pulling out material from the bottom of the car. If loaded cars remain on hand for more than 24 hours, they are circulated once daily, so as to maintain a temperature of approximately 400° F. Material at this temperature in the tank car can be quickly elevated to 475° F while loading distributors. Tank trucks or distributors loaded out at the car at 475° F lose little temperature before the last of the load is pumped underneath the pavement. Capacities of the tank trucks and distributors now in use range from 1500 gallons to 3000 gallons. A 3000-gallon load is usually pumped under the pavement in about 1 hour and 20 minutes.

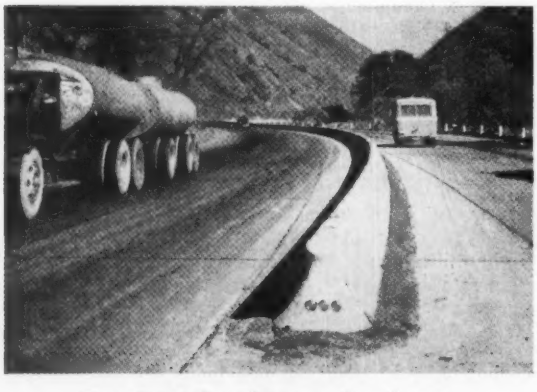
### *Pumping Crew Organization*

A pumping crew generally consists of 8 men—2 are flagmen, 1 mop man to dampen pavement surface around holes, 1 nozzle man, 1 plugger to plug holes and 3 cleanup men. This crew, plus 2 truck drivers, 3 car heater operators and the hole driller accompanied by a flagman, places an average of 20,000 gallons of asphalt per normal working day.

The Texas Highway Department and Army maintenance forces have successfully introduced high melting point asphalt underneath pavements in the presence of free water and thin mud. This fact was definitely established when several 3′ x 9′ sections of pavement were removed 24 hours to 48 hours after subsealing under these conditions. Higher temperatures, about 500° F, are generally used when free water is encountered.

The melting point of the asphalt used for this work is of much more importance than the penetration. A material having a minimum Ring and Ball melting point of 175° F may not be expected to extrude through large cracks or holes at pavement surface temperatures of 140° F.

Subsealing of broken pavements is considered as a very necessary treatment prior to leveling and surfacing. As previously stated, it stabilizes rocking slabs, fills cavities, regains uniform subgrade support, seals out surface water, and assures a lower and more uniform moisture content of the subgrade, which reduces movement of the pavement. These factors are of great importance in providing for a durable and smooth riding surface.



**Center barrier for safety on grade and curve.**

## Equipment Used in Highway Construction

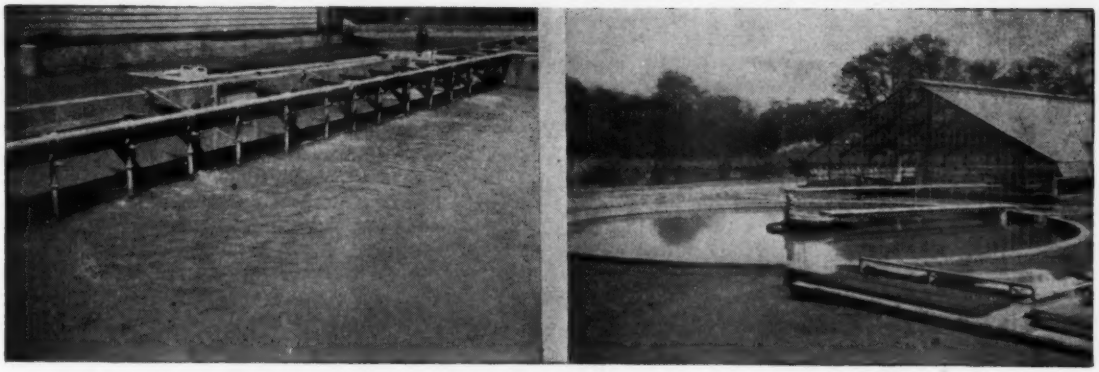
Paving of the Highland Creek—Oshawa section of the dual highway between Toronto and Oshawa, 18.21 miles of dual concrete pavement, is being carried out under four contracts. In constructing 5.04 miles of this, the McHaffie-Birge Construction Co. uses the following equipment: One Byers shovel, 1¼ cu. yd.; one Lorain shovel, ¾ cu. yd.; one Northwest shovel; one Koehring shovel, ¾ cu. yd.; two aggregate bins; one Galion MG6 motor-grader; one Caterpillar motor-grader; two Bren gun carriers; two wobble-wheel rollers; one Buckeye finegrader; one McCormick Deering roller; two Jaeger finishers; one Koehring 34-E paver; one Jaeger spreader; one Canadian Ingersoll-Rand air compressor; two water-tank trucks; six batch trucks; nine dump trucks.

The next 4.36 miles is being built by Curran & Briggs, which firm is using: One ¾ cu. yd. Lorain shovel; one 1½ cu. yd. Lorain shovel; one 2½-cu. yd. Northwest shovel; two No. 12 diesel patrol graders; one 5-ton Buffalo-Springfield tandem roller; two pneumatic tired International tractors; two 5-ton wobble-wheel rollers; one 27E Koehring paver; one Blaw-Knox finisher; one Jaeger spreader; two C. H. & E. pumps; one Smart-Turner pump; one portable crushing and washing plant; one 3-kw. Delco lighting system.

The other two contracts, totaling 8.81 miles, were let to the Brennan Paving Co. The equipment used by them comprises: Three Caterpillar D7 tractors; one Caterpillar D8 tractor; one Caterpillar D4 tractor; one LeTourneau scraper, 15 cu. yd.; one LeTourneau scraper, 16 cu. yd.; one LeTourneau scraper, 12 cu. yd.; one P & H Model 600 shovel, 1 cu. yd.; one P & H Model 400 shovel, ¾ cu. yd., one Caterpillar RD-8 diesel engine to run crusher; one Caterpillar RD-7 diesel engine to run crusher; one Koehring Model 401 shovel, 1 cu. yd.; one Koehring Model 251 shovel, ⅝ cu. yd.; three Minneapolis Moline tractors; one Allis-Chalmers tractor; one Sawyer-Massey motor-grader; one Adams motor-grader; one Caterpillar motor-grader; two wobble-wheel rollers; two Buffalo-Springfield 10-ton, 3-wheel rollers; one Buffalo-Springfield 6-ton, 3-wheel roller; one Gorman-Rupp pump with 3-in. suction; one C.H. & E. pump with 3-in. suction; two Gorman-Rupp centrifugal pumps; two Multifoote 27-E pavers; one Blaw-Knox spreader; one Ord concrete-finishing machine.

## Deflector Barrier for Added Safety on Curves

The California Highway Department has installed a new type of deflector barrier on the hazardous Grapevine grade on US 99. This is a 6% grade, 4.9 miles long, which has an average traffic of 7,000 vehicles a day, of which 1,000 are trucks. This new barrier is of concrete, with a parabolic base, to deflect truck wheels and prevent trucks from using it as a rubbing strip to reduce speed. It is cast in units 10 ft. long, each weighing about 3,000 pounds. Cost of the experimental section of 2,000 ft. was about $20,000.



Left, aeration arrangement at clarifier inlet; right, circular primary clarifier.

# Solving Sewage Treatment Problems at Ridgewood

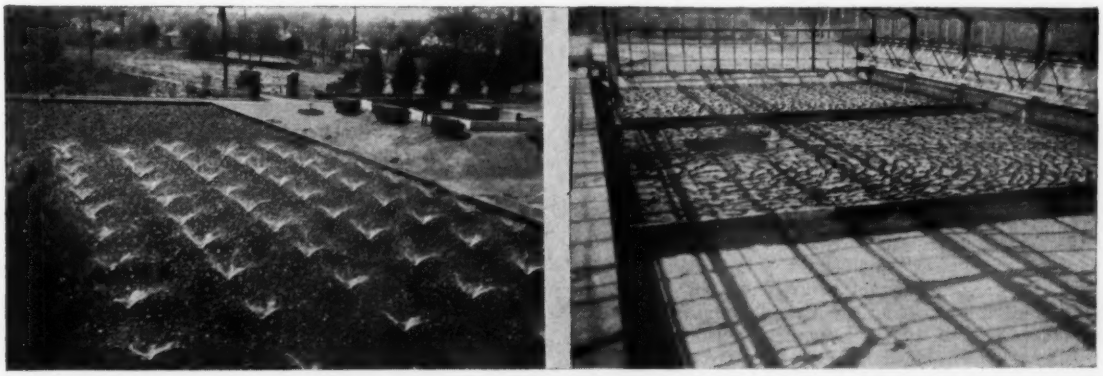
**How various problems have been met, and solved, including an overloaded treatment plant, the effect of tree roots and the war emergency.**

RIDGEWOOD, N. J., which is located in the northern New Jersey commuting zone, is a Village of about 18,000 population. It has had a series of problems in sewage treatment, which have been solved largely through the patient work of John W. Hood, Superintendent of Sewage Treatment. The plant, with a capacity of slightly less than 1 mgd, consists of a mechanical detritor; a comminutor; two clarifiers which can be operated in series or in parallel; a chemical mixing tank with mechanical mixers and flocculator, which is located between the two settling tanks but can be utilized in a number of ways; a trickling filter; and a final settling tank. The filter is 0.6 acre in area, 5½ ft. deep, and is equipped with fixed spray nozzles.

Even before the war, the plant was overloaded, and operation was reinforced by chemical treatment, using alum. Experience soon demonstrated that the sewage was unusually difficult to treat and that even with high dosage of chemicals satisfactory results were obtainable only part of the time. An extended investigation into the causes of these difficulties developed a new concept of sewage treatment, and of the behavior of a coagulant with sewages of certain characteristics. In general, it was demonstrated that the ability of a coagulant to produce an effective floc can be measured by matching the characteristics of the specific water or sewage against the following table:

| *Zone* | *pH* | *Alkalinity* | *Remarks* |
|---|---|---|---|
| 1 | 7.0 | 100-125 | Easily clarified with moderate dosage |
| 2 | 7.5 | 125-175 | Higher chemical dosage needed |
| 3 | over 7.5 | over 175 | Difficult to clarify; excessive dosages required |

Though Ridgewood's water is drawn from wells, its classification on this scale should be no worse than 2. Investigations were therefore continued to determine why, for considerable periods of time, the sewage arriving at the plant was high in the 3rd zone. The sewer system is not unduly long; there are no industries that could account for this change in character. By a process of patient research and elimination of successive factors, it was determined that tree roots in the sewers were an important, and perhaps a deciding factor. Ridgewood is famous for its tree-shaded streets; these trees reached into the sewers, partially clogging them, with the result that each lateral and



Left, trickling filter in operation; right, sludge drying beds.

house sewer became a miniature septic tank, turning out an effluent that was high in alkalinity.

Previously a step had been taken to clear the sewers of *Beggiatoa,* which is a sulphate reducing organism. This was accomplished by the application of copper sulphate through manholes into the sewer system, two barrels being used over a 2-day period. This treatment eliminated the odor problem, which previously had been serious; and it also permitted more effective prechlorination and a reduction in chemical dosage. Though it helped, this treatment did not solve the problem facing Mr. Hood.

### *Conditioning the Sewage*

Following treatment to remove *Beggiatoa,* a program was begun to reduce the pH and alkalinity of the sewage so as to bring it from zone 3 into zone 2 or 1. After trying several chemicals, carbon dioxide was determined to be the cheapest and most effective. The settling tank effluent contained a considerable amount of $CO_2$ but settling tank capacity was insufficient to permit recirculation; therefore, an arrangement was set up whereby the digester gas was burned to form carbon dioxide, which was applied to the sewage through diffusers. The application of $CO_2$ to the sewage reduced the required chemical dosage and the chemical cost by nearly one-half. Moreover, results were excellent no matter how heavy the load, or how high the pH or alkalinity of the raw sewage. A crystal clear effluent could always be obtained with moderate dosages of alum, which was the coagulant used. The heat of the gas burned in producing the $CO_2$ was utilized for heating the digester.

Thus by 1941, the plant was well under control and was producing a satisfactory effluent with a reasonable cost for chemicals. Then the war came; and the war had a tremendous appetite for all chemicals. Soon alum became hard to get, and then harder; then "war-time" alum made its appearance, but it was unsatisfactory so far as Ridgewood's plant was concerned. It became necessary to abandon the use of chemical coagulation and to rely on biological processes. Fortunately, two steps in this direction had already been taken which made the transition possible.

With the cooperation of Village Commissioner A. J. Faber and Village Engineer Robert Raymond, more extensive work had been undertaken on the problem of getting rid of roots in house sewers. A trial was made, on a limited scale, of the application of copper sulphate through house plumbing fixtures to kill the roots in the house sewers. This trial demonstrated that the roots could be killed in this manner without injury to the trees. The program was then extended. Householders were asked permission to dissolve 2 or 3 pounds of copper sulphate in the toilet bowl—not in metal fixtures lest corrosion damage them. This work was done mainly by one man; permission had to be obtained from the individual householder. The copper sulphate was applied at periods of low flow so as to provide the greatest possible contact period in the sewers. As this program became more widely effective, the troublesome characteristics of the sewage were gradually reduced.

The necessity for conditioning the sewage to permit effective chemical coagulation with minimum dosages of coagulant, while providing a crystal clear effluent at all times, suggested the possibility of improving operation without chemicals through a modified method of preconditioning the sewage. Continued research and testing developed procedures for measuring the treatability of the sewage by means of the oxidation-reduction potential. The mixers and flocculator are utilized to aerate the sewage, supplying dissolved oxygen, and conditioning it for final treatment on the trickling filters. It has been found that, in general, the same zones of pH and alkalinity apply as in chemical coagulation, in that they, with the oxidation-reduction potential, indicate the treatability of the sewage.

Physical changes were also made in the plant, though these did not involve any major construction. A time clock was installed to regulate removal of sludge from the older and smaller clarifier so as to keep the sewage as fresh as possible by hourly removal of the sludge. Sludge from the final clarifier is recirculated to the mixing tank where it is mixed and aerated with the sewage. The trickling filters were improved by installing new dosing tank equipment to provide more uniform application to the beds, and by changes to permit alternation of sewage to and from half the bed area.

The degree of treament now being obtained is indicated by the average of the results for January, 1947. The BOD of the raw sewage averaged 345 ppm; and the suspended solids 420 ppm. In the final effluent, the BOD content averaged 34 ppm. and the suspended solids 5 ppm. The relative stability of the effluent was 95% plus.

## Crack Filling by Machine Lowers Cost

An experimental method of crack filling has been tried in Wayne Co., Mich., and has proven to be extremely satisfactory. This new method made use of a crack filling machine, now on the market, which is equipped with burners to keep the bitumen hot and also to provide heat to a "U" shaped shoe which is attached directly behind the pouring nozzle to keep the material hot and fluid until the crack is entirely filled. Any excess is automatically wiped off, which eliminates the necessity of using any blotting material such as sand or chips. This in itself is a major advancement in that no ridges or bumps will result from the operation as in the past.

The material used in the machine is preheated in a 165-gallon tank mounted on a small truck, together with a 60-cubic foot air compressor which is used to blow the dirt from the crack to be filled. The cost of this equipment is far less than that used in the old method and there is a considerable saving in the cost of materials used. In addition only three men are required in the operation which is just half of those required to man the old tar crews.

## Damage Resulting From Inadequate Culvert

The New York Court of Claims (Loman v. State, 59 N. Y. S. 2d 492) awarded damages to an owner's property resulting from the State's alleged negligence in constructing and maintaining a culvert located on a highway. The damage was done during a severe rainstorm in the vicinity of the claimant's property, during which water, shale, stone and debris from a catch basin flooded plaintiff's property and damaged a boathouse.

The court said the storm was not one of unprecedented severity, that the flow of water might have been foreseen by the State and provided against by a larger and more adequate drop inlet or catch basin which would not have been so obstructed; and the failure by the State to construct a culvert of adequate proportions to take care of the water from a stream constituted a defect in the highway.

# Chromate Corrosion Inhibitors in Air Conditioning Waters

**The large volume of water used in air conditioning, and its cost usually requires recirculation to save water, and water treatment to save the recirculating system. This article tells how chromates are used.**

**By MARC DARRIN**
**Chief Research Chemist, Mutual Chemical Company of America***

THE increasing use of air conditioning equipment has overtaxed many municipal water mains, and has also overloaded sewage lines. As a result many cities restrict the amount of water that may be used for air conditioning. This often makes it necessary, as well as economical, to employ recirculating systems. In these systems corrosion products, rust, sediment and slime, may accumulate and cause trouble long before corrosion seriously damages the equipment. Fortunately, the control of corrosion in a recirculating system is easily accomplished with a small dosage of chromate or bichromate, the amount depending on the character of the water and the nature of the system being protected, but approximating 250 ppm.

### *Chromate Protection*

Chromate inhibits corrosion by forming a passivating film on the exposed surface of the metal. The nature of this passivation has been described by Evans,[7] Speller,[11] and others.[1] Once a passive state has been established, smaller concentrations of chromate effectively maintain it.[6] Necessarily the water must not be acid in character—preferably it should be slightly alkaline. It is desirable that the amount of dissolved salt be less than 1000 parts per million—the less dissolved salt, particularly chlorides, the better. Actually chromates reduce corrosion at any salt concentration, but cannot prevent it entirely at high concentrations.

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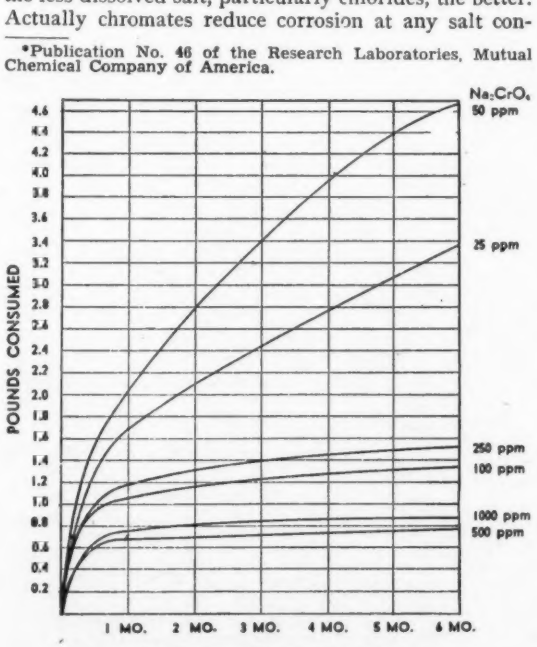
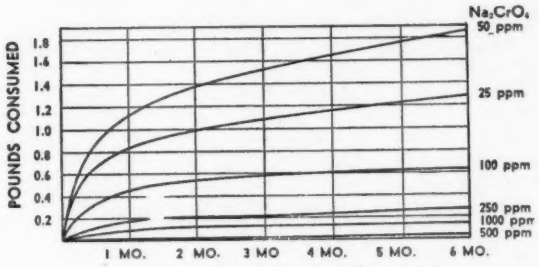



**Curves for water containing 1000 ppm Na Cl.**




**Curves for water containing 10 ppm Na Cl.**

Allowance for chromate consumed in protecting the metal may be made by following the accompanying charts. These show the number of pounds of sodium chromate consumed per 1000 square feet of completely submerged and aerated ferrous surface at room temperature (70°F.) with the water maintained slightly alkaline (pH 7.5 to 9.5). At higher temperatures the rate of consumption of chromate increases somewhat. The effect of various amounts of chloride is also shown.

*Estimating Optimum Concentration:* From the curves, and the amount of water required for makeup, the most economical concentration of chromate can be estimated for the particular chloride content which may be encountered. To provide a factor of safety, it is ordinarily advisable to use not less than 100 ppm.; nor should the minimum amount be employed before the system has been in operation long enough for the protective film to become stabilized.

Since chromate is concentrated by evaporation at approximately the same rate as the salt coming in with the raw water, the effect of this concentration must be considered in figuring the makeup. For example, assume that 250 ppm is the desired chromate concentration, that 10% of the treated water is evaporated on each circulation through the system, and that this amounts to 1000 gallons per hour which must be made up by addition of raw water containing 100 ppm of sodium chloride. If the maximum chloride concentration for satisfactory operation is 1000 ppm, it is necessary to run to waste 100 gallons per hour to keep below this permissible maximum. Since this drawoff

contains 250 ppm of chromate, it is necessary to add an equivalent amount of chromate to the makeup water. But, the makeup is ten times the volume of the drawoff, so it need contain only one-tenth the concentration, namely 25 ppm chromate. In this case: 25 x 1000 x 8.33 ÷ 1,000,000 = 0.21 pound of sodium chromate per hour.

*Unit Systems:* In trials[2] with several small air conditioning units, weekly observations over a period of 18 months showed that the use of sodium chromate prevented corrosion and eliminated the formation of slimes. Two new units without chromate accumulated a large amount of slime during the same period. One old unit which has accumulated slime and rust prior to the test completely cleared during the 18-month chromate treatment. Because of fluctuations in overflow, the concentration of sodium chromate during these tests varied between 100 and 500 ppm.

*Large Central Systems:* Excellent results have been obtained with chromates in a number of large installations over a period of years.[3, 8, 12] The amount of chromate required depends on individual factors, chiefly: the nature and location of dissimilar metals; the character of the water, including its temperature, chloride content and pH; the volume of water in relation to the metal surface with which it comes into contact; loss of water by overflow, drawoff, leakage, windage and evaporation; and the character of air, such as presence of acidic or reducing substances. These variations make it difficult to predict the minimum amount of chromate which will protect a particular installation. In general, a maintained chromate concentration of 250 ppm will be satisfactory; but the treatment should be initiated with 500 ppm and kept at about this concentration until rust and old corrosion products have been loosened and removed from the system, and the water has a clear, light yellow color. If there is little loss of water from the system, there is some economy in maintaining this concentration, since consumption of chromate in the chemical protection of the metal surface is lowest at a fairly high chromate concentration, as shown by the accompanying charts. If there is considerable overflow or other loss of liquid from the system, then the resulting mechanical loss of chromate may be sufficiently important to justify lowering the chromate concentration by small amounts down to the minimum effective concentration; but it is seldom desirable to operate below 200 to 250 ppm, since this entails frequent testing and is less effective.

The concentration of chromate in the water system may be judged by comparing the yellow color of the water with that of solutions of known strength. It is also essential that the water be fairly alkaline (pH 7.5 to 9.5), and this should be checked from time to time in the customary manner. If the water does not give a faint pink color with phenolphthalein, caustic soda should be added. Good practice, when starting to use chromate, requires checking the yellow chromate color nd alkalinity once a week, and making such additions bichromate and caustic soda as may be indicated.

### Bimetallic Corrosion

The best way to combat bimetallic corrosion is to eliminate dissimilar metals, but this is often impractical for structural reasons, or because of existing installations. A partial remedy is to insulate, as by painting. It is less helpful to paint corroded steel or iron (anodic metal) near exposed brass (cathodic metal) than it is to paint the brass. This is because painting the iron may increase the density of the resulting galvanic current at unavoidable pores or breaks in the coating, and thus intensify pitting, or it may transfer the corrosion to some other anodic area.[4]

Although it is best to avoid contact of dissimilar metals, and higher concentrations of chromate usually are required when dissimilar metals are present, no difficulty is encountered in protecting an ordinary iron or steel system having only a few contacts with brass. Some extremely bad bimetallic combinations (aluminum-copper or zinc-copper, for instance) though benefited, cannot be completely inhibited by chromate, especially in the presence of chlorides. These combinations are usually avoided by designers.

The amount of chromate required for an all-aluminum system is substantially lower than for all-iron. A galvanized or zinc system also requires lass chromate than an all-iron system, provided, of course, that contacts with copper and brass are avoided. If there is some exposed iron in a galvanized system, it is safe to use the same concentration of chromate as for an all-iron system. Sometimes a little less chromate can be employed in such a case, since the chromate, in addition to passivating the iron, may also deposit a protective film of zinc chromate on the galvanized surface, thus protecting both the iron and zinc simultaneously.[4]

*Aeration Corrosion Controlled:* Even when there are no bimetallic contacts, there is danger of corrosion due to aeration which cannot be avoided in air conditioning equipment. For this reason alone it is advisable to employ chromates in practically all air conditioning water systems, since the efficiency of chromate for inhibiting corrosion is unaffected by aeration.[3]

*Chromate vs Bichromate:* The most economical form in which to add chromate is sodium bichromate plus sufficient caustic soda to neutralize it. The amount of caustic required is about 27 pounds for each 100 pounds of sodium bichromate, the precise proportions depending on the natural alkalinity of the water. Both compounds may be introduced in solid form. The addition of caustic soda to sodium bichromate changes it to sodium chromate: $Na_2Cr_2O_7.2H_2O + 2NaOH = 2Na_2CrO_4 + 3H_2O$. One pound of sodium bichromate is equivalent to 1.087 pounds of sodium chromate. The bichromate goes a little farther, costs less per pound and is the form most readily available.[10] Sodium chromate is a little more convenient to use since it requires no caustic soda additions to adjust the alkalinity, and for this reason it is frequently used in small installations. The choice between chromate and bichromate is chiefly one of balance between cost and convenience. Equally effective results may be obtained with either.


**Literature Cited**

1. Bauer, O., "Korrosion Metallischer Werkstoffe," Vol. *I*, Ann Arbor, Mich., Edwards Bros., 1943.
2. Darrin, Marc, Ind. Eng. Chem., Anal. Ed., *13*, 755-9 (1941); Proc. Ann. Water Conf., Eng. Soc. Western Penna., *2*, 59-69 (1941); Sci. Am., *174*, 161-3 (1946); A.S.T.M. Bulletin No. *138*, 37-9 (1946); No. 142, 48-50 (1946); Metal Industry (London), *68*, 351-2 (1946).
3. Darrin, Marc, Am. Soc. Refrigerating Engrs., 1944 Corrosion Report, pp. 21-7; Mutual Chemical Co. of Am., Serial No. 34 (1946).
4. Darrin, Marc, Ind. Eng. Chem., *37*, 741-9 (1945).
5. Darrin, Marc, Ind. Eng. Chem., *38*, 368-75 (1946).
6. Darrin, Marc, "Chromate Corrosion Control for Engine-Jacket Cooling Water," Corrosion and Material Protection (in press).
7. Evans, U. R., "Metallic Corrosion, Passivity and Protection," London, Edward Arnold & Co., 1938.
8. Friends, W. Z., Heating, Piping, Air Conditioning, ASHVE, Sec. 13, 788 (1941).
9. Mutual Chemical Co. of Am., "Chromate Corrosion Inhibitors for Internal Combustion Engines," Serial No. 33 (1945); Diesel Power and Diesel Transportation, *24*, 578-82 (1946).
10. Mutual Chemical Co. of Am., "Corrosion Control in Air Conditioning," Serial No. 35 (1946).
11. Speller, F. N., "Corrosion—Causes and Prevention," 2nd Ed., New York, McGraw-Hill Book Co., 1935; 3rd Ed. (in press).
12. Sterne, C. M., Proc. Am. Soc. Testing Materials, II, *35*, 261-71 (1935).

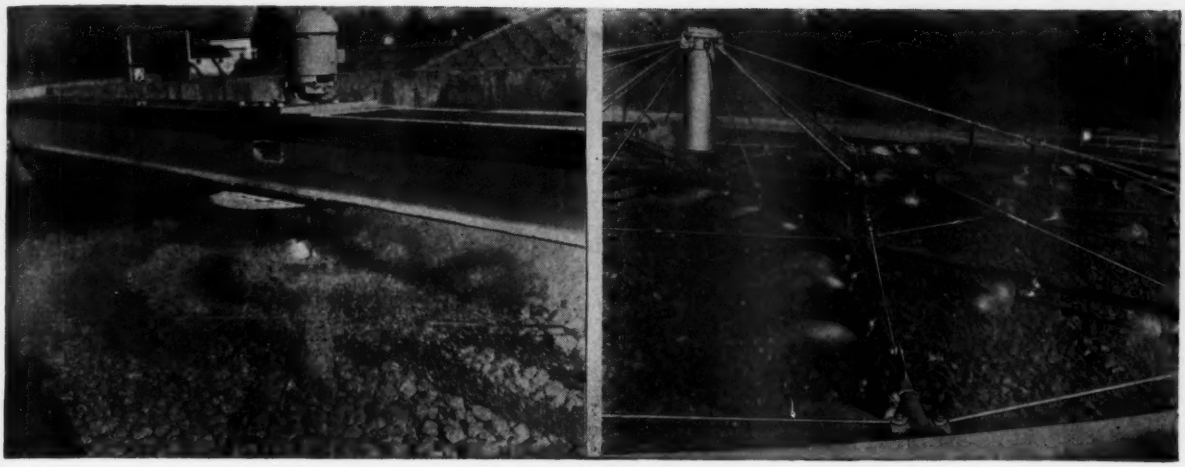


Fig. 1. Left, the disc distributor; right, the multiple arm rotary distributor.

# TRICKLING FILTERS

**Aero-Filters: Distribution factors—rate of application—filter loading—single-stage treatment—multiple-stage treatment—recirculation practices.**

**This article was prepared by Robert C. Gloppen of the Sanitary Engineering Department of Yeomans Brothers Co., and coordinated by the Editors of Public Works and Consultant Staff.**

THIS article deals with one classification of the "high-rate" trickling filter group. Previous articles have established a general classification of trickling filters as "high-rate" or "low-rate" in accordance with the magnitude of the BOD loading per unit volume of filtering material and the method and rate of application of the sewage to the filter. This article goes further into the general classification to discuss a specific type of filter of the high-rate group. In this discussion, the term "low-rate" will be used to describe the low *momentary* rate of sewage application whereby a high daily capacity for BOD reduction is obtained. This process has, as its basic principle, the method and rate of applying the sewage. The filter is known commercially as the Aero-Filter and the process as the "Halvorson-Smith" process. It was developed by Dr. H. O. Halverson, Professor of Bacteriology at the University of Minnesota, and R. L. Smith, Consulting Engineer of St. Paul, Minn.

## Distribution Factors

In the high-rate filter group, there are two schools of thought with reference to the method and rate of applying the sewage to the filter. One recirculates the filter or final tank effluent to bring the oxidizable material into contact with the bacterial growth on the filter media, resulting in repeated passages of the sewage through the filter. The other applies the sewage over the media in a very thin film which, with sewage of normal characteristics, may require only a single passage of the sewage through the filter, depending on the degree of treatment required.

In his studies of filter operation, Dr. Halvorson found that more effective BOD reductions were obtained when the settled sewage was applied to the filter continuously in a very thin film. The Halvorson-Smith process utilizes this method and Aero-Filter distributors have been designed to apply the sewage in a raindrop form over a maximum area of the bed surface at the same instant. Under this method, it is obvious that the ideal condition of sewage distribution would be attained by a continuous rain-drop application over 100% of the bed surface at all times. The Aero-Filter disc distributor most nearly approaches this condition of distribution by continuous, uniform and complete coverage of the bed surface; this is available for filter diameters up to 34 ft. For beds of large size, the Aero-Filter reaction-type multiple arm distributor provides momentary coverage of approximately 20% of the bed area through the use of centrifugal-type spray nozzles on the arms and their branches. Montgomery, of the Lakeside Engineering Co., has demonstrated that the 20% momentary coverage is obtained when the distributor arm is held in a stationary position. Therefore, with the distributor operating at the recommended speed of 3 rpm., it can be seen that the rate of application very nearly

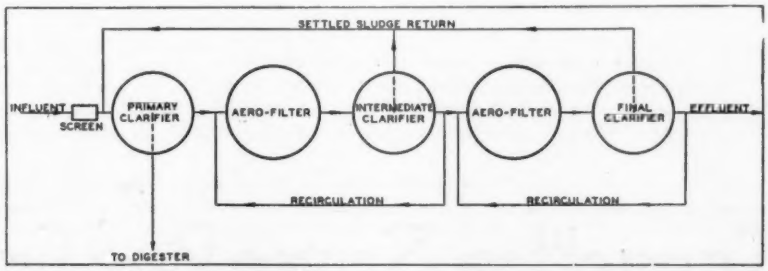



Fig. 5. Typical flow diagram, two-stage Aero-Filter plant.

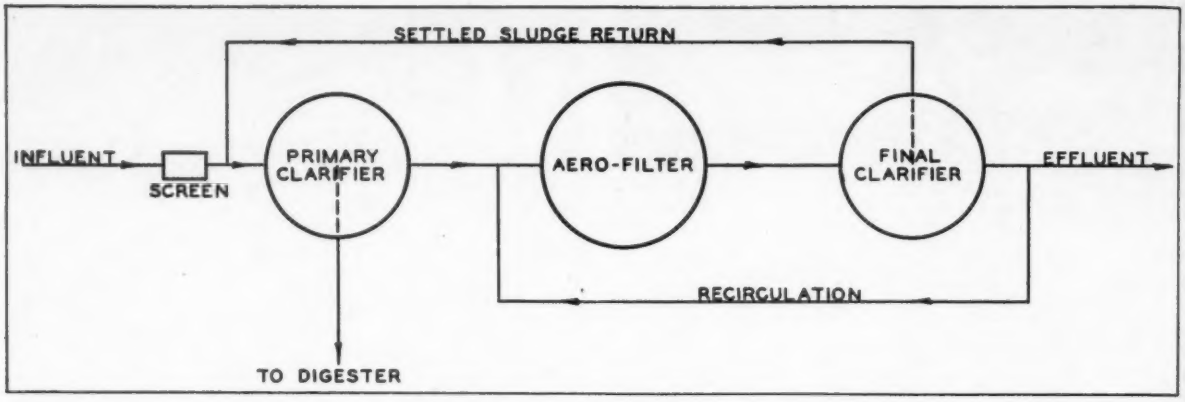



**Fig. 2. Typical flow diagram, single stage Aero-Filter.**

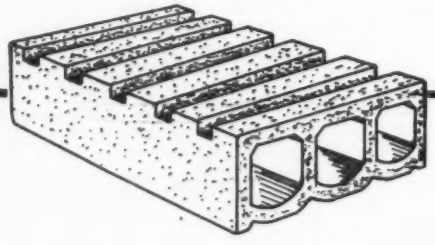
approaches the ideal condition provided by the disc distributor.

This raindrop form of distribution results in the low momentary rate of application. With a ten-arm Aero-Filter distributor, the quantity of sewage falling upon each square foot of filter surface per unit of time is much less than it is with the conventional type of distributor. On this basis, the conventional filter may be considered to have a low capacity and a high momentary rate of application, while the Aero-Filter has a high capacity and a low momentary rate of application. Other high-rate filters have a high capacity and a high momentary rate of application.

## Rate of Application

The Aero-Filter, with its low momentary rate of application, does not require recirculation to provide the bacterial growth in the filter with access to the oxidizable sewage particles. However, during periods of low raw sewage flow, a sufficient volume of sewage should be recirculated to maintain continuous proper operation of the distributor; and recirculation may be necessary with strong sewages, if an effluent having a low BOD is desired.

Based on his studies of filter operation at various rates, Dr. Halvorson concluded that organic loadings could be greatly increased if the filter were dosed continuously at a constant rate of 12,500 gpm per acre which, on a 24-hour basis, equals 18 mgad. This is the average rate of application recommended for Aero-Filters, which are normally 6 to 8 ft. in depth. Effective operation of a distributor designed to apply sewage at this rate (18 mgad) would be seriously impaired if the flow of sewage fell too far below this rate; the efficiency of the special nozzles would decrease; and if the flow became small enough, the distributor would stop, due to insufficient head to maintain rotation. Since this would be contrary to the

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principles of the Halvorson-Smith process, it is necessary to provide pumping equipment capable of maintaining, by recirculation of the final effluent, a flow sufficient to insure that the distributor will continue to operate effectively. The minimum rate for proper operation is about 13 mgad. Sewage volumes insufficient to maintain this rate are normally encountered in gravity flow plants only during period of low night flow.

### Filter Loading

All references to the BOD of the sewage applied, or to the BOD loading per unit volume of filtering material, are based on the BOD of the settled sewage. The ability of the preliminary treatment units to reduce the raw sewage BOD has a direct bearing on the overall efficiency of the entire plant, and a specific relation to the filter requirements; for the greater the reduction in the loading, or the increase in treatability, that can be realized through the preliminary units, the less will be the burden on the filter and final clarifier.

This discussion is based on a conventional arrangement with a screen, followed by a primary settling tank through which a reduction of about 35% in the raw sewage BOD is obtained. Also, all references to reductions through the filter will be understood to mean reductions through the filter and following clarifier, since it is fundamental that these two units work as a team and should be considered as such.

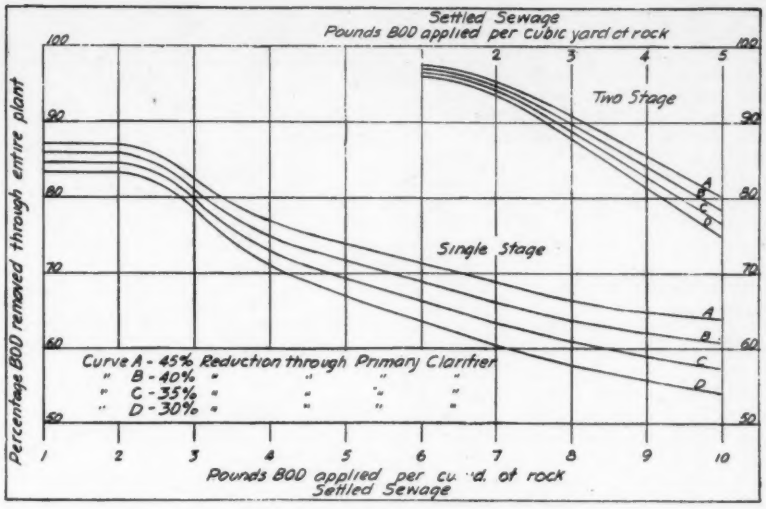
Settled Sewage
Pounds BOD applied per cubic yard of rock
Two Stage
Single Stage
Curve A - 45% Reduction through Primary Clarifier
" B - 40% " " " "
" C - 35% " " " "
" D - 30% " " " "
Percentage BOD removed through entire plant
Pounds BOD applied per cubic yard of rock
Settled Sewage

**Fig. 3. Single- and two-stage removal curves.**

Records from operating plants have borne out the fact that the percentage of BOD removal per cubic yard of filtering material remains fairly constant for any loading up to a maximum of 2 pounds of BOD per cubic yard of media. From 2 lbs. to 2.5 lbs. per cubic yard, the efficiency decreases only slightly; but from this point upward the reduction in efficiency becomes more rapid. Operating results indicate that Aero-Filter plants designed on the basis of a maximum loading of 2 lbs. of BOD per cubic yard of media will effect overall plant reductions (including primary units) in BOD ranging to 84% and 85%, based on 35% removal of BOD in the primary, without the use of recirculation except as previously mentioned during periods of low sewage


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Ducts: Each 4" wide by 3½" high; Cross-sectional area per duct, 12.5 sq. in.

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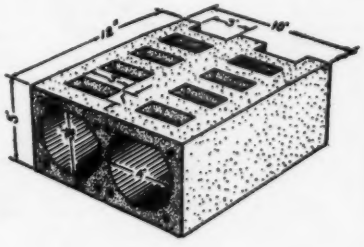

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**flow. The 2-lb. loading corresponds to** a loading of 3220 pounds of BOD per acre-foot, but in order to provide for inaccuracies in estimating the load to be handled, it is recommended that a loading of 3000 lbs. per acre-foot be used for determining the quantity of filter media required. The 3000-lb. loading corresponds to 1.86 lbs. of BOD applied per cubic yard of media. This is the desirable loading for installations throughout the United States.

## Single-Stage Treatment

Single-stage Aero-Filters, with a good quality of media and without recirculation, will effect an average reduction of about 78% of the applied BOD through the filter and final clarifier, with a maximum load not exceeding 2 lbs. per cubic yard of media. If it is desired to maintain a final effluent having a concentration of not more than 30 ppm. BOD, the strength of the sewage applied to the filter should not exceed 135 ppm. This will correspond to a raw sewage strength of about 200 ppm BOD with 35% reduction through the primary units. To maintain a 30-ppm effluent with stronger sewage, recirculation will be required in an amount necessary to reduce the strength of the applied sewage to approximately 135 ppm. However, if a final effluent of greater strength is acceptable, the strength of the applied sewage may be increased proportionately. For example, to obtain an effluent having 40 ppm BOD, the sewage applied to the filter may have a BOD of 185 ppm. Allowing for a 35% reduction through the primary units, this would represent a raw sewage having a BOD of 285 ppm. In general, it is recommended that recirculation equipment be provided in the design of single-stage plants to treat sewages having high BOD concentration.

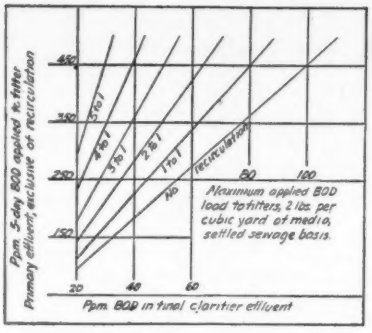
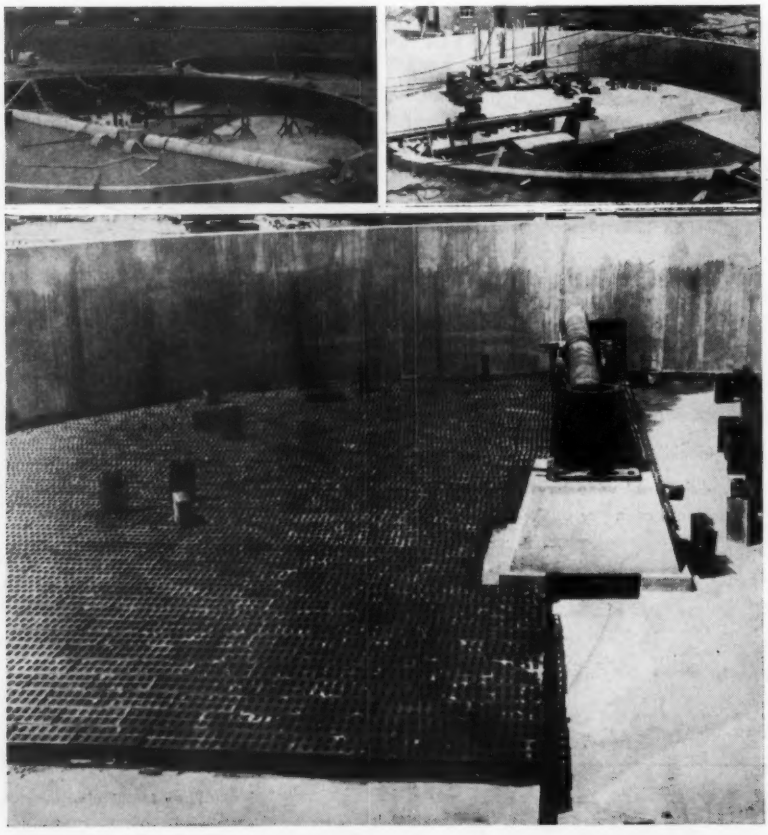



**Fig. 6. Effect of recirculation.**

These figures are based on the curves shown in Fig. 4, which have been derived from actual operating experience. With a loading of 2 lbs. per cu. yd., and a removal of 78% of the BOD by the filter and following clarifier, the effluent will have a content of 22% of the applied sewage. Thus, for 30 ppm. BOD in the effluent, the applied sewage cannot have a strength greater than 136 ppm.

(Editor's Note: The reductions in BOD through the filter and secondary clarifier, as cited by Mr. Gloppen and based on actual data gathered from Aero-Filter plants all over the country, are somewhat in excess of those reported by the Board of Public Health Engineers of the Upper Mississippi Basin. A number of State Boards of Health utilize the data in this report as a basis for design, and may therefore require high-rate filter plants to be designed in accordance with it. The Upper Mississippi Report states that, within the loading limits up to 2 lbs. per cu. yd., the reduction in BOD through the filter and secondary clarifier will be: $R = 0.66L - 0.02$, where R is the reduction in 5-day BOD by filter and clarifier in pounds per sq. ft. of filter surface per day, and L is the filter loading, including that due to recirculation, in pounds per sq. ft. per day. This formula indicates a reduction of 64% through the filter and clarifier for a loading of 2 lbs. per cu. yd. The curve developed by the National Research Council (SWJ, Sept., 1946) indicates a removal of 69% through the filter and clarifier with the same loading.)

# ARMCRE
## FILTER BOTTOM BLOCKS

- *Top Left:* Laying ARMCRE Filter Bottom Blocks at Paris, Ky. Howard K. Bell, Cons. Engr.
- *Top Right:* Placing a floor of ARMCRE Filter Bottom Blocks at Paris, Ill. Warren & Van Praag, Cons. Engrs.
- *Bottom:* Close-up of easy-to-lay ARMCRE blocks at Paris, Ill.

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### Multiple-Stage Treatment

Stage treatment is recommended when treating raw sewage having a BOD in excess of 400 ppm; or when a very low BOD content is required with a raw sewage strength in excess of 250 ppm BOD. In all cases of stage treatment, the use of intermediate clarifiers is strongly recommended.

A two-stage Aero-Filter plant with the same quantity of filtering material will give higher percentages of BOD reduction than will a single-stage plant. The same total quantity of media is required but the quantity of media is proportioned between the filters to provide a somewhat larger actual unit loading in the first-stage filter. Experience with operating plants indicate that the most effective ratio of the filtering material is 60% to 65% of the total quantity in the first stage. Curves have been developed to show the BOD reduction through the filter and clarifier; Fig. 4 may be used for computing the reduction through both single- and two-stage filters. For example, if a two-stage plant were designed to handle 1 mgd of raw sewage having a BOD of 450 ppm and if the filtering material were proportioned 65% in the first stage and 35% in the second stage, the total quantity of media required based upon a loading of 1.86 lbs. per cubic yard and a 35% reduction in the primary tank, would be 1310 cubic yards. The recommended unit loading on the first-stage filter would be 2.87 lbs. per cubic yard and according to Fig. 4 the filter would affect a 69% reduction in the applied BOD. The actual unit loading on the second stage filter (458.5 cu. yds. of media) would be 1.65 lbs. per cubic yard and the filter would effect a 78% reduction in the applied BOD, see Fig. 4. Thus, the final effluent would carry a daily residual BOD of 166 lbs. and the overall reduction through the entire plant would be about 95% without recirculation, except as may be required during periods of low raw sewage flow. All of these steps can be worked out by reference to Fig. 4.

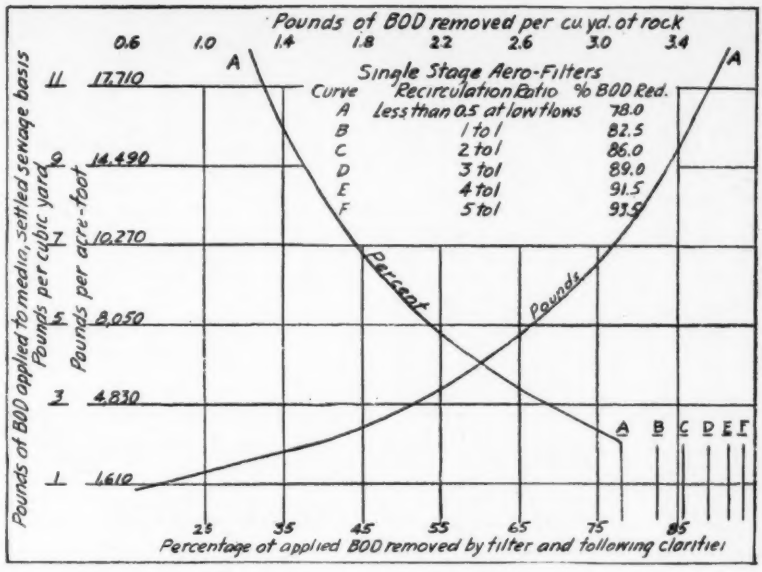
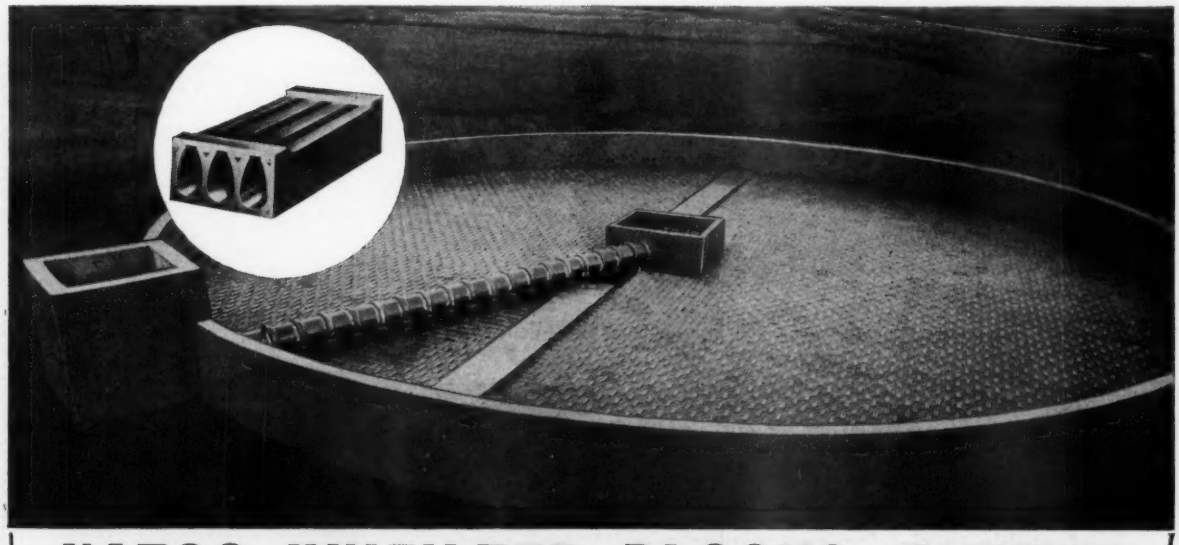



**Fig. 4. BOD removal for various loadings.**

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### Recirculation Practices

Recirculation should always be practiced during periods of low sewage flow but only in an amount necessary to maintain the minimum rate of application at which the distributor and centrifugal nozzles will function properly.

A strong waste can be converted to one having a lower BOD by recirculation of various amounts of final effluent to the filter. Single-stage plants can be designed to handle much stronger wastes by providing recirculation in amounts necessary to dilute the applied sewage to the strength previously discussed. As the amount of recirculation is increased, the capacity of the clarifier, connecting piping and the pumping equipment must be increased proportionately; and since a two-stage plant with the same quantity of filtering material and treating the same strength sewage will, without recirculation, provide results superior to those from a single-stage plant, it appears advantageous to use the two-stage design for strong sewages. A two-stage plant will provide overall reductions of 90% to 94% in BOD when treating raw sewage having a strength of 425 ppm, without recirculation; whereas a single-stage plant treating the same sewage would require a recirculation ratio of 3 parts to 1 part of raw sewage to attain the same results. A curve showing the relation between the strength of the applied sewage to the quantity of the final effluent for various ratios of recirculation is shown.

### Summary of Design Data

Filter loadings are based on the BOD of the settled sewage as applied to the filter. Filter loadings up to 2 lbs. BOD per cubic yard of filtering material are recommended. Effluents having a BOD of less than 25 pmm should not be expected. The rate of application should be about 18 mgad at the average daily rate of flow. The minimum rate of application should be about 13 mgad. The maximum rate of application may be about twice the minimum rate. Best results are obtained from filters having a media depth of 6 to 8 feet; 5 feet should be the minimum.

Subject to state health department requirements, primary clarifiers should have a detention period of 2½ hours at the average rate of flow and an overflow rate of 650 to 800 gallons per square foot area per day; intermediate clarifiers a detention period of 1½ hours on the same basis and an overflow rate of 1200 to 1500 gallons per square foot area per day; and final clarifiers should be on the same basis as the primary clarifier. An available head of 3′ 6″, including friction losses, should be provided for operation of the distributor.

Throughout this discussion, specific effort has been made to avoid reference to Aero-Filter plants now in operation. However, all information contained herein is based on data gathered from operating plants all over the country; and the records, curves and other items mentioned herein are available to interested parties from Yeomans Brothers Company of Chicago and The Lakeside Engineering Company of Chicago, both licensees of the Aero-Filter process under the Halvorson-Smith patent and manufacturers of Aero-Filter equipment.

***Information on the Accelo-Filter, with design curves and data on operation, will be published in the July issue.***


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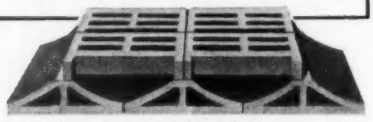
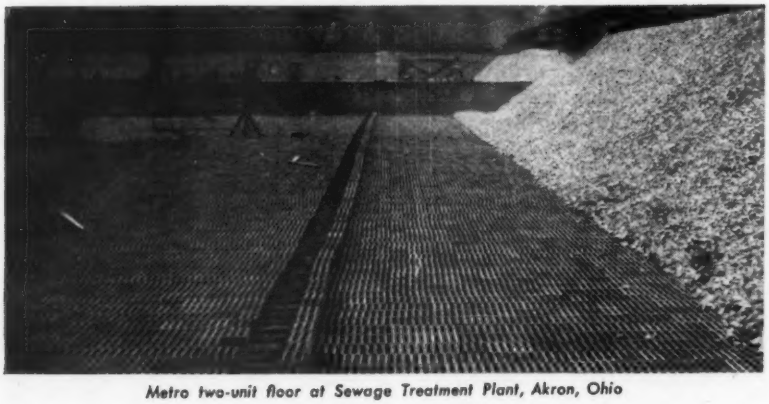


***Two-Unit Trickling Filter Floor***



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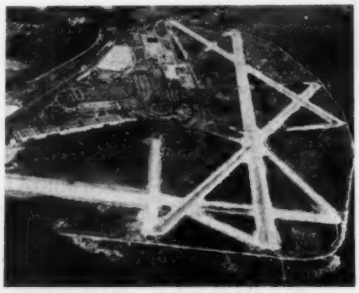

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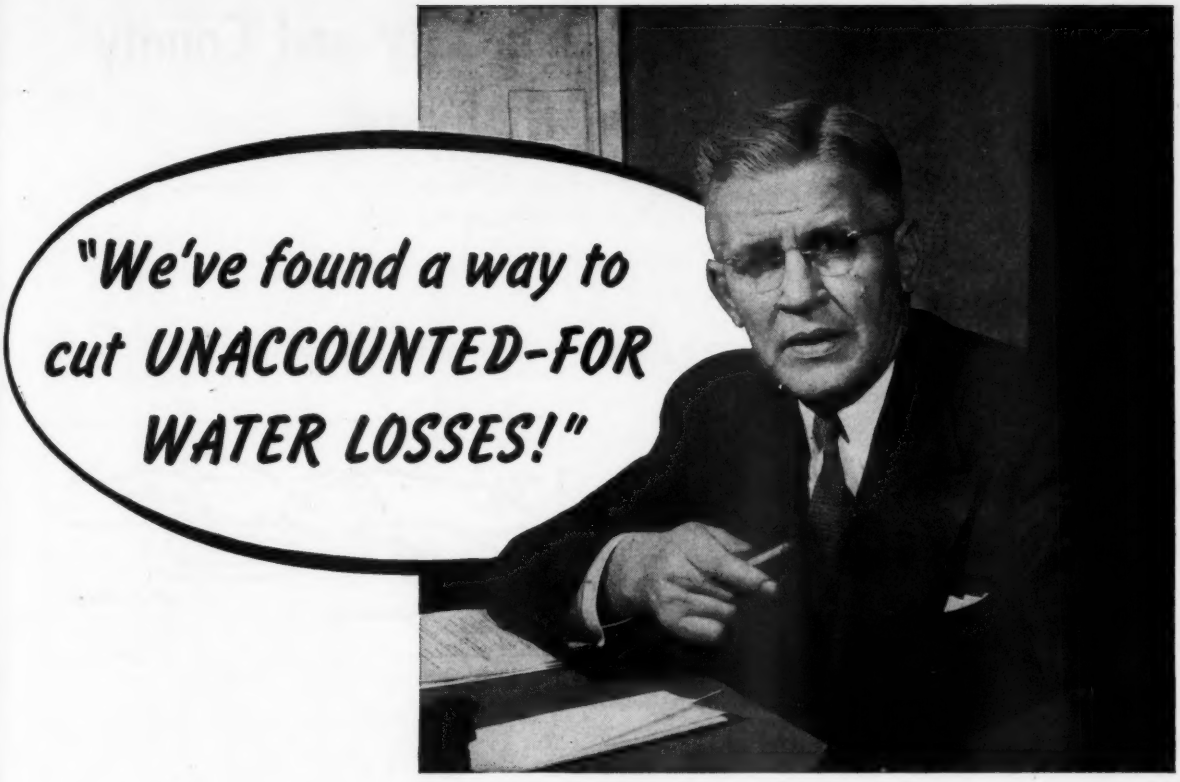


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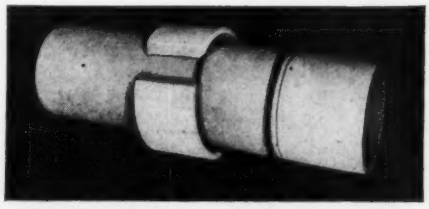
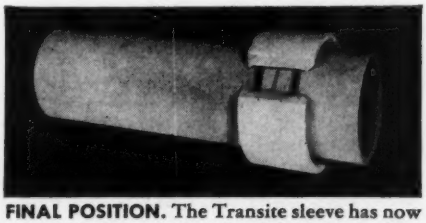


**CUTAWAY VIEW** shows the Simplex Coupling at start of assembly. Note the position of the Transite sleeve and two rubber rings.



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# Legal Decisions Regarding City and County Streets and Highways

**Damages caused by inadequate culvert; fallen trees on highways; "engineer's" fee; advertising for bids.**

**By JOHN SIMPSON**

*Advertising Procedure for Bids.*—The Illinois Appellate Court [Folkers v. Butzer, 13 N. E. 2d. 624], affirmed a decree enjoining the payment of certain anticipation tax warrants of Waldo township, Ill., issued to contractors for the balance of the contract price for grading, draining and graveling roads within the township because the statutes had not been complied with in that no advertisement for bids was made, no notice posted, and no plans, specifications, or estimates filed in the office of the commissioner or clerk.

The court said that in Illinois it has been held that commissioners of highways have no powers except such as are conferred by statute, and contractual obligations can be imposed by them on the municipality only so far as they are expressly authorized to incur same or such as are incident to those expressly conferred.

Where by statute a public officer can only let contracts to the lowest bidder after advertisement, a contract made in violation of such contracts, the court holds, is illegal. The steps adopted by the municipality with reference to the letting of the contract shall be of such a nature and in such form as to invite competition. In order that persons desiring to bid upon such contracts may do so upon a uniform basis, such statutes invariably provide that plans and specifications for the improvement must be adopted by the body corporate prior to inviting the bids, which plans and specifications are made public and those desiring to bid may do so in a bona fide manner. Such plans and specifications are essential to competitive bidding, and it is only through their agency that the public has any reasonable assurance that all bidders are competing upon the same basis and without favoritism. The purpose of such statutes is the protection of those who will be called upon to pay for the work.

*Fallen Trees in Highways.*—Action was brought against a county for injury sustained by a pedestrian by the fall of a decayed tree across a highway. The South Dakota Supreme Court held [Robinson v. Min-

**Proceed at your own risk!**

nehaha County, 277 N. W. 324], that there is no common law liability on the part of a county for such damages. And statutes requiring counties and municipalities to keep their highways in safe condition for travel deal only with the surface of the passageway, and, being in derogation of the common law, may not be extended by judicial construction to impose liability for falling trees or branches.

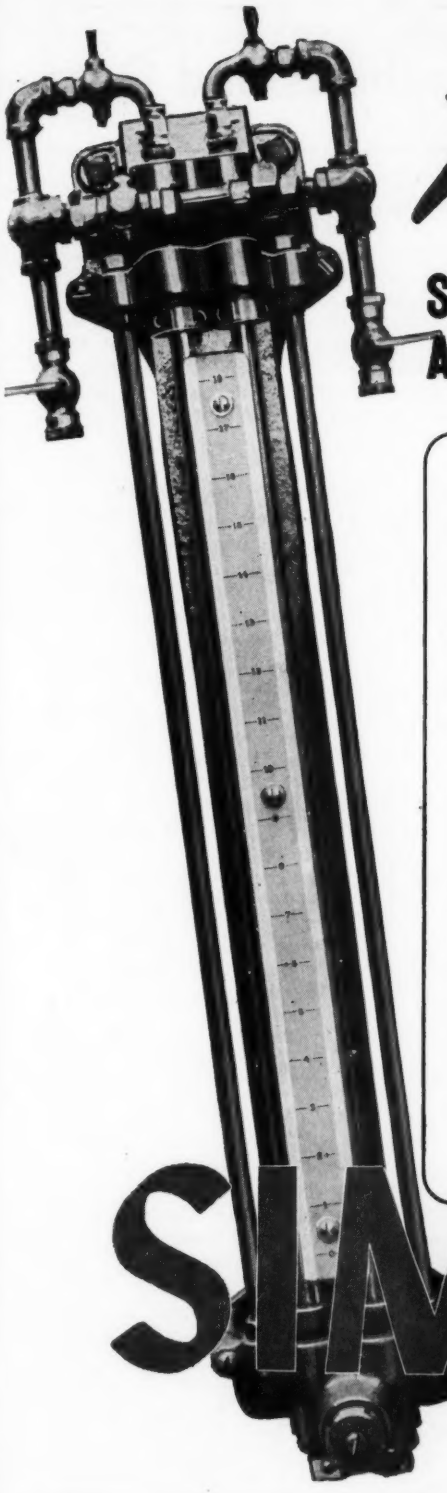
*Flooding By Inadequate Culvert.*—In an action in the New York Court of Claims by the owner of land abutting on a state highway for damages to his property by flooding caused by an inadequate culvert in the highway, the New York Appellate Division

**The only compensation for a flooded culvert.**

[Logan v. State, 5 N. Y. S. 2d. 908], affirmed a judgment for plaintiff in the Court of Claims (296 N. Y. S. 639) awarding damages. At the time the gravel road was being paved by the state, the claimant had notified the engineer in charge that the culvert was inadequate to carry off flood waters, but no change was made, the engineer stating that the state did not have money enough to put in a bridge at that time. While the damages were caused by a defect in the highway, for which the state claimed it was liable only between May 1 and November 15, the court said they were also the result of negligence of the state's officers and employes and liability therefore resulted to the state under section 12-a of the Court of Claims Act by which the state waives its immunity from liability for the torts of its officers and employees.

The Kansas Supreme Court [Engler v. Aldridge, 147 Kan. 43, 75, P. 2d. 290], holds that an independent contractor who performs a contract with the State Highway Commission for the construction of a highway improvement authorized by statute according to the plans and specifications therefor, where the work is performed with proper care and skill is not liable to abutting owners for flooding damages. It is also held that the contractor is not liable for damages to abutting owners, occurring after the contractor has completed the work and turned it over to the State Highway Commission, although the damage may have resulted from the contractor's failure properly to perform his contract.

*Engineer's Fee.*—In an action for money due the plaintiff for engineering services in connection with certain street improvements, the Illinois Appellate Court held (Marr, Green & Co. *v.* Village of Gray's Lake, 15 N. E. 2d. 64) that the village could not escape liability under its trustees' contract for engineer's services in making preliminary plans, estimates, etc., for the improvements, on the ground that the contract was void as creating debt, payable from the village's general fund, without previous appropriation, under the Illinois statute.



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# Public Works Engineering Methods and Data

## Cost of Laying Water Mains in Elmira

During 1946, Elmira, N. Y., laid 16,334 ft. of water mains and added 254 individual service connections. The size, length and cost of each are as follows:

| *Size* | *Ft. Installed* | *Total Cost* | *Av. per Ft.* |
|---|---|---|---|
| 12" ..... | 2,238 | $10,965.24 | $4.72 |
| 10" ..... | 2,173 | 9,393.36 | 4.32 |
| 8" ..... | 2,648 | 8,495.16 | 3.17 |
| 6" ..... | 7,791 | 19,001.86 | 2.44 |
| Small ..... | 1,394 | 2,599.80 | 1.90 |

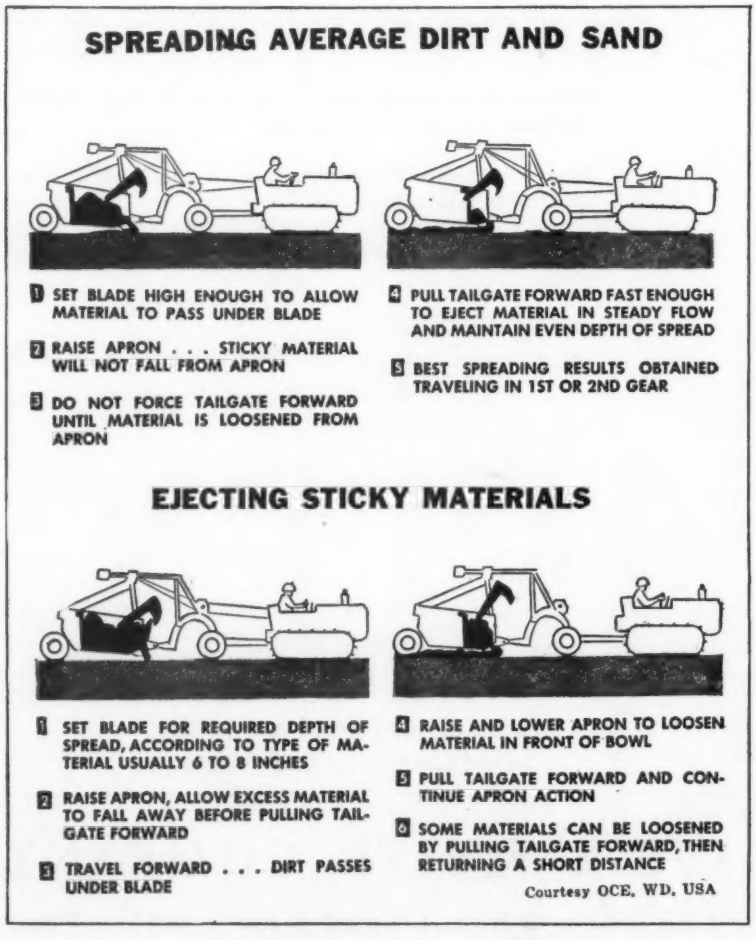
## Traffic Capacity of Crossings and Roundabouts

Traffic capacity, that is the number of vehicles carried per hour, may be calculated for a theoretical road and checked with relevant statistics: (1) the traffic capacity of a direct crossing is always superior to that of a crossing where the traffic turns off; (2) the roundabout has the greatest traffic capacity of all forms of unregulated movement; (3) the oblique crossing has a smaller traffic capacity than the direct crossing and the difference varies with the degree of obliquity; (4) different intensities of traffic in the two directions at a right-angled crossing lead to a greater traffic capacity throughout the crossing; (5) the traffic capacity of a roundabout is dependent on the space available; (6) the choice of diameter for the central island in a roundabout will depend on the number of converging roads and on the minimum distance necessary for vehicles in the circular current to change gear.—*Strade; Road Abstracts.*

## Location of Underground Services

A joint Committee of the Institution of Civil Engineers and the Institution of County and Municipal Engineers (of England) was appointed in 1945 to draw up data on the best location of underground services. It was later joined by representatives of various interested services, including electricity, gas, water, telecommunications, public lighting, and sewers, and the report is mainly concerned with urban areas. Replies to a questionnaire showed that practice as regards the location, order, and depth of underground services varied widely. The desirability is emphasized of adopting a regular order of placing, and where practicable of placing mains under the sidewalk rather than the roadway in order to minimize disturbance of road foundations and interference with traffic during repairs, replacements, etc.

The following recommendations are made:—1. *Service mains.* In general a regular arrangement can be achieved if a width of 10½ ft. is available on both sides of the street. The mains should be laid in the following order (boundary towards curb): electricity, gas, water, telecommunications. Diagrams show suggested depths and clearances, and a recommended layout for link disconnecting boxes, joint pits, valves, hydrants and siphon pipes. At road junctions pipes and ducts should be laid before the road is constructed. When practicable mains should be laid on both sides of the road. 2. *Transmission and trunk mains.* If sufficient width is not available under the sidewalks, or central reserves of major traffic routes, these mains should be run beneath minor roads. 3. On *bridges* the mains should be


SPREADING AVERAGE DIRT AND SAND
1 SET BLADE HIGH ENOUGH TO ALLOW MATERIAL TO PASS UNDER BLADE
2 RAISE APRON . . . STICKY MATERIAL WILL NOT FALL FROM APRON
3 DO NOT FORCE TAILGATE FORWARD UNTIL MATERIAL IS LOOSENED FROM APRON
4 PULL TAILGATE FORWARD FAST ENOUGH TO EJECT MATERIAL IN STEADY FLOW AND MAINTAIN EVEN DEPTH OF SPREAD
5 BEST SPREADING RESULTS OBTAINED TRAVELING IN 1ST OR 2ND GEAR
EJECTING STICKY MATERIALS
1 SET BLADE FOR REQUIRED DEPTH OF SPREAD, ACCORDING TO TYPE OF MATERIAL USUALLY 6 TO 8 INCHES
2 RAISE APRON, ALLOW EXCESS MATERIAL TO FALL AWAY BEFORE PULLING TAILGATE FORWARD
3 TRAVEL FORWARD . . . DIRT PASSES UNDER BLADE
4 RAISE AND LOWER APRON TO LOOSEN MATERIAL IN FRONT OF BOWL
5 PULL TAILGATE FORWARD AND CONTINUE APRON ACTION
6 SOME MATERIALS CAN BE LOOSENED BY PULLING TAILGATE FORWARD, THEN RETURNING A SHORT DISTANCE
Courtesy OCE, WD, USA

**Methods of spreading various types of soil.**

carried in pipe bays under the footpaths. 4. As the use of special *sub-ways* to facilitate access to the mains for maintenance and repair is not favored by many authorities their use is recommended only to carry mains under the roadway at major crossings. 5. *Sewers* should normally be placed below the roadway. Where separate systems are provided for sewerage and for surface water the former should be laid at the greater depth. Recommendations are also made with regard to the location of man-holes. 6. *Planting of trees.*

The planting of curbside trees in city streets should normally be discontinued. In conclusion, it is urged that the underground work of statutory authorities should be co-ordinated and the position of the various services accurately recorded by means of plans on a suitable scale and kept up to date.—*Road Abstracts.*

## Yankton Swimming Pool Will Use Diatomaceous Filters

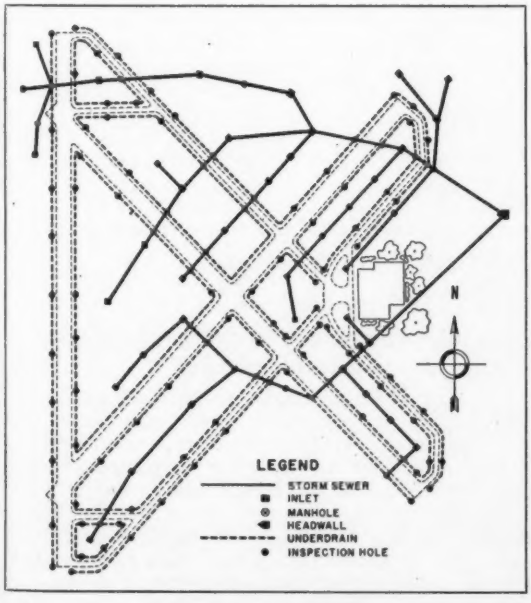
Contracts were recently awarded by Yankton, S. D., for a swimming pool and construction has been started. This will be the first swimming pool in the state to use diatomaceous filters, which were developed during the war for use by troops in the field. These filters do not use sand, but instead use a filtering material that is much finer than sand; this is applied hydraulically onto porous cylinders, a very thin layer sufficing to accomplish purification.

## Typical Drainage Layout for Airports

After a detailed topographical map has been drawn of the present and future airport area, subdrains and storm sewers can be laid out. The airport drainage system shown herewith is typical. Storm sewers with inlets at low spots catch and drain much of the surface water from non-surfaced areas. These same storm sewers provide outlets for the runway subdrains.

To intercept ground water and to carry away the runoff from surfaced areas, subdrains are laid on both sides of the runways.

Storm sewers are of standard or extra strength




**Drainage plan for an airport.**

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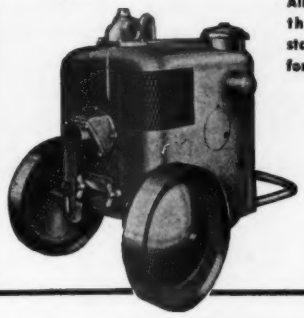

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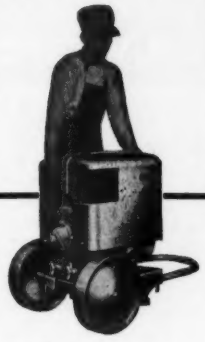

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clay pipe, depending upon pre-estimated loads. The joints are sealed. Subdrains are of standard or extra strength clay pipe, regular or perforated, laid with open joints in a porous backfill. Inspection holes are indicated on the map.

In making a drainage layout of this kind it is important to plan for all future expansions. By doing this, the original drainage system can be designed to handle future runoff without alterations or replacements. *Clay Pipe Manual*

## Diversity in Practices in Concrete Pavements

In a paper before the ARBA convention entitled "Structural Features of Concrete Pavements," T. J. Kauer, managing director, Wire Reinforcement Institute, reported some of the information concerning practices of State highway departments obtained through questionnaires. Among these, it was shown that distributed reinforcement for the control of cracks is now used in 37 states of 46 reporting, and three more states use it under some circumstances such as for resurfacing with poor subgrades, and for bridge approaches. Thirty-two of 37 reporting use welded wire fabric, 15 also using bar mats; two others also use expanded metal; 24 in all use bar reinforcement; nine states in all use expanded metal. Details of use and weight per square foot vary bewilderingly, the weight per 100 sq. ft. ranging from 30 to 86 lb. and averaging 54 lb.

Slab cross-section is still another variable. Uniform thickness sections now predominate in 30 of 46 states reporting, some of which also use the thickened edge. The tendency away from the thickened edge is apparently due to the fact that lane widths of 22 and 24 ft. do not place heavy concentrations of traffic on lane edges, as was the case with 18-ft. slabs. Subgrade preparation difficulties also are a reason. Eight states build 8 in. uniform concrete, eleven states 9 in., four states 10 in.

## Methods of Increasing Municipal Income

Cities are currently using one of three principal ways to increase property tax yields, which normally account for about three-fourths of the income of the average city. According to the Municipal Finance Officers Association, these three methods are: (a) By increasing tax rates; (b) by upward revaluation of property; and (c) by assessing property at more nearly its full value, instead of at a small fraction of its value. The largest single item responsible for the necessity of increasing income is municipal salary increases. There is no standard basis for assessments, these varying from a small percentage of the value to 100% in the case of some of the larger cities.

## Highway Cost Trends for the First Quarter of 1947

The cost trends in highway construction, as prepared by the Public Roads Administration for the first quarter of 1947, show: Common excavation, 38 cents a yard, up 1 cent from the last quarter of 1946, and 108.3% of the 1925-1929 base; concrete pavement, $3.01 per sq. yd., down 7 cents from the preceding quarter and 135.7% of the base; structural concrete, $43.35 per cu. yd., up 49 cents from the preceding quarter and 188.1% of the base; the composite mile of road, 133.9% of the base and up 0.6% from the preceding quarter.

You can control the cost of the damage to your hydrants that are damaged in traffic accidents if they are MUELLER-COLUMBIAN because the SAFETY FLANGE takes the shock when it is hit a sufficient blow to cause damage. There is no loss of water, one man can install a new SAFETY-FLANGE section in a few hours time, and the cost for parts is less than $8.00.

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# PUBLIC WORKS DIGESTS

**Sewerage**

**Water Supply**

**Highways and Airports**

***This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of the principal articles, in which the articles in each periodical are numbered consecutively throughout the year, beginning with our January issue.***

**The letter and number at the end of each item refer to those used in the Bibliography. Numbers not found in the current Bibliography will be found in the one published the previous month.**

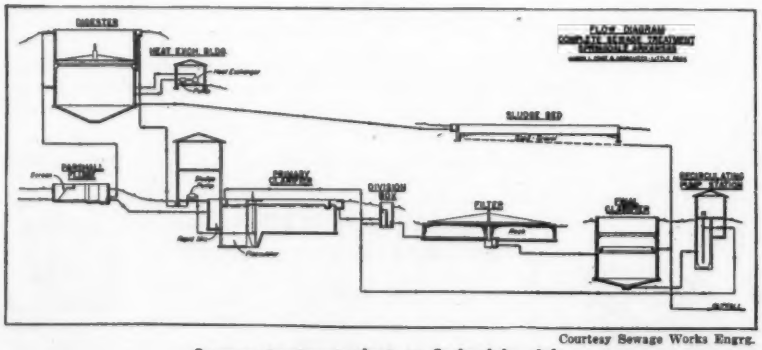
# *The Sewerage Digest*

### Treating a Sewage With High Waste Content

Springdale, Ark., has a population of approximately 3500. During the peak of the canning season, five industries discharge into the sewers waste equivalent in volume to the sewage from 11,000 persons, and in organic load to that from 16,700. The sewers discharge into a stream that is otherwise dry for a major portion of each year. The different wastes varied in pH from 4.35 to 10.5, and some had a BOD of 900 ppm.

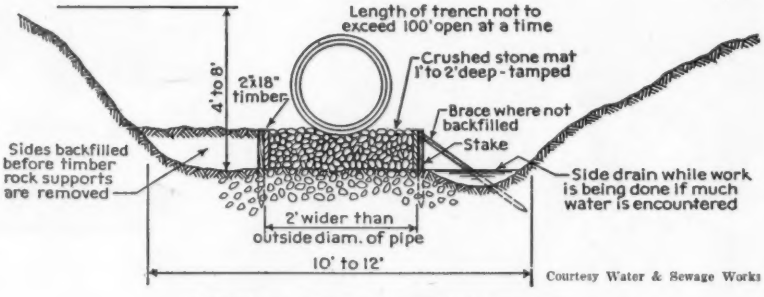
In studying the problem of disposal and apportioning the cost of constructing and operating a plant, estimates were made for a plant to treat domestic sewage only, one to treat combined sewage and wastes pretreated to the strength of normal domestic sewage, and one to handle sewage and wastes with no pretreatment except screening. The last appeared to be the most economical, costing $140,000 and $10,000 a year to operate, while the first would cost $55,000 and $2,800 a year. The industries agreed to pay $55,000 toward the construction of the third type, and pay a sewer service charge based on water consumption, and this type was adopted.

A treatment plant has been completed consisting of a parshall flume, chlorinator, chemical feeders, rapid mixer, flocculator, 2 primary clarifiers, 2 high-rate filters, 2 final clarifiers, a heated digester and sludge beds. Lime and chlorinated copperas will be added to the raw sewage. The detention period in the clarifiers at minimum domestic flow is 20 hr., but this is reduced by recirculation. The high-rate filters are designed for 1.35 lb. BOD per cu. yd. of filter with a recirculation ratio of 2 to 1. The digester has a capacity of 3 cu. ft. per capita of equivalent population.[H27]




Courtesy Sewage Works Engrg.

**Sewage treatment plant at Springdale, Ark.**


Length of trench not to exceed 100' open at a time
4' to 8'
2"x18" timber
Crushed stone mat 1' to 2' deep - tamped
Brace where not backfilled
Stake
Sides backfilled before timber rock supports are removed
Side drain while work is being done if much water is encountered
2' wider than outside diam. of pipe
10' to 12'

Courtesy Water & Sewage Works

**Stabilizing a sewer with a crushed stone mat.**

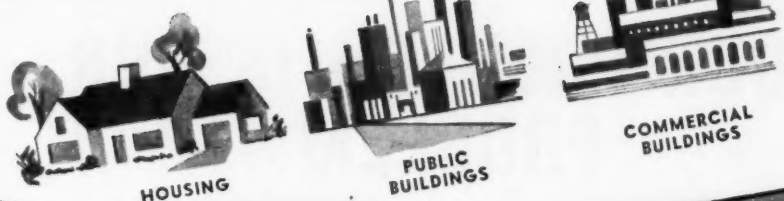
### Making Tight Sewer Joints

Cement joints, no matter how well made, can not remain tight if the sewers settle after construction. Bituminous joints will remain tight if the movement of the sewer is confined within reasonable limits, but this may require special treatment in soft soils. Such treatment in Jacksonville, Fla., consists of supporting the pipe on either a platform of 2" x 8" plank laid longitudinally on a series of 2" x 8" piles spaced 24" c to c and generally 18" to 48" long; or on a series of 3" x 8" caps resting on pairs of 2" x 8" piles. In the San Francisco Bay area during World War II, more than 100 miles of sewer pipe were laid in fills on marsh land and with limited time for construction, and were bedded in crushed stone mats 12" to 24" deep and 24" wider than the pipe, compacted by tamping. (See illustration.) In New Orleans the soil is very unstable, and sewers are laid between two lines of 2" sheathing, extending 42" below the sewer invert; a horizontal 6 x 6 spiked along each line of sheathing supporting a platform of 2" plank, on which the sewer is placed in a bed of sea shells 8" thick under the sewer and packed around the haunches.

# for

## LONG TIME ECONOMY IN SEWAGE AND WASTE DISPOSAL

**HERE**

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**A Modern Planning Tip:** The many advantages of Extra Strength Clay Pipe are making it an "every day" material on large and small jobs. It is the new pipe for extra-heavy live or dead loads. On many jobs it eliminates the need for cradling or casement.

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Los Angeles 15, Calif.

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*When you need special information—consult the classified* **READERS' SERVICE DEPT.**, *pages 69-73*

In Gary and Hammond, Ind., where 36" to 84" sewers were laid in sand 5 to 20 ft. below the water table and infiltration was required to be limited to 1,000 gpd in Gary and 500 in Hammond, the water was lowered 2 ft. below the invert by well points and the sewer pipes were jointed with rubber gaskets, and the infiltration does not exceed 250 to 500 inch-gallons. In these joints, a rubber gasket is fastened with rubber cement to the spigot end of each 5 ft. length of reinforced concrete pipe and fits tightly between spigot and bell when the pipe is forced home. The remainder of the bell depth, about 1", is filled with cement mortar.[G15]

### Storm Sewers For Highways

This article refers to English conditions, and a 2-yr. rainfall rate of $\frac{30}{T+10}$ for times less than 20 min. and $\frac{40}{T+20}$ for over 20 min. In calculating the size of storm sewers needed to carry off rainfall on highways or airports, it is common practice to use a flat run-off rate of 0.5" to 1.0" for all cases. This tends to make the sewer too small at the upper end and too large at the lower end. The time T includes that required for the water to reach the side ditch and flow in this to the nearest inlet—usually between 3.5 and 8 minutes. It also includes the time required to fill the sewer, which is not often considered but may be highly important; an 18" sewer, even if completely blocked, would hold the run-off from a 45 ft. road during an hour's rainfall. Another factor to be considered is the possible decrease in carrying capacity of the sewer with age, due to coatings of slime and deposits of detritus, of which there is no information available.[D19]

### Chemical Precipitation And Oxidation in England

The Kingston-on-Thames plant treats about 2,500,000 gpd of sewage from 44,000 population plus trade wastes. Before the war, aluminum sulphate had been used as a precipitant, made at the plant. As bauxite became scarce during the war, use was made of spent residues from aluminum industry, which contained a little aluminum but was principally iron oxide. The effluent was passed through 48 trickling filters. A new power station was needed by the town, and it was decided to use ⅔ of the treatment plant area for this purpose, and to secure better precipitation and substitute chemical oxidation for filtration, abandoning the trickling filters.

Chlorinated copperas had not been used widely in England, but was tdopted here, being made at the plant in practically the same manner as is employed in the United States. The amount found necessary for satisfactory reduction of suspended solids, for 2,500,000 gpd, is 1200 lb. of copperas and 160 lb. of chlorine. The cost of this precipitant is about 60% of that previously used.

For oxidation as a substitute for filtration, chlorine is applied during 13 day hours, but not at night. The rate during the 13 day hours averages 47 ppm. No trace of residual is found in the effluent. The oxygen demand of the effluent is reduced to an average of 25 ppm, sometimes as low as 10 ppm. Also there is considerable deposit of sludge in the contact tank amounting to 50% of that in the settling tank effluent.[D26]

### Fungus in Iron Sewers

A mile of the sewer conducting combined sewage to a treatment plant at Bishop Auckland, England, is 30" cast-iron pipe. Salt is used on the roads in winter, and at this time the sewer discharges large amounts of a grey, slimy jelly-like fungus, about 1" thick and in lengths up to 1 yd. While this discharge is reaching the plant, one man is kept constantly raking the screen for days. The fungus will not settle, and covers the surface of the tanks. It is believed that this is a growth in the iron pipe which is broken down when the chlorine content of the sewage passes a certain figure.[D17]


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### Construction on Sanitary Fills

From 1939 to 1942 New York City placed between one and two million cubic yards of mixed garbage and refuse on 130 acres of swamp by the sanitary fill method; the fill to be used for recreational purposes. In 1946 the city started building 367 temporary houses on this fill. This necessitated grading to depths as great as 8 ft., and digging trenches for sewers and water mains, thus removing the 2 ft. of earth cover and cutting into the refuse. Odors from this were serious, and had to be prevented. If exposed garbage was at once covered with 6" of earth, the odors were suppressed; but this was not possible in trenches. For minimizing the odors, the only materials found satisfactory were oxidizing agents, especially "OD-30," using 20 to 100 lb. per acre of exposed material.

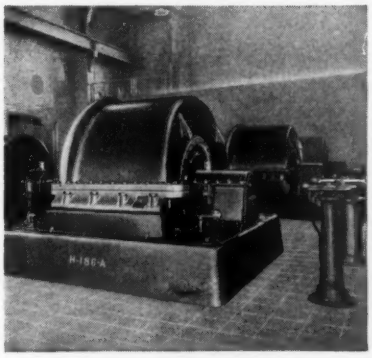
More serious was the fact that organic matter in landfills continues to decompose for more than 30 years, giving off gases. These are not odorous, but those from a fill 4 yr. old contain 56% methane, which, if collecting in buildings placed on the fill, might form a highly combustible mixture. To prevent this, the floors of the houses were raised about 2 ft. above the fill, leaving an open space for the diffusion of the gases; and an aluminum-foil membrane was secured to the under side of the flooring. "It is apparent that sanitary landfills, if it is at all possible, should not be opened so as to expose any of the decomposing refuse."[E5]

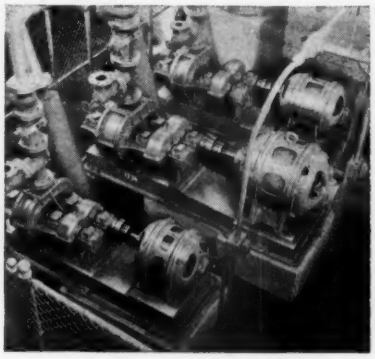
### A New Process For Garbage Utilization

A process developed for utilizing hotel garbage has recently been tried experimentally with municipal garbage at Los Angeles, Calif. After removing all non-organic materials, the garbage is reduced to particles none larger than a bean and heated in steam-jacketed troughs, where it is mixed by paddles similar to a pug mill; then is pushed through barrels, the walls of which consist of parallel steel bars about 0.2 mm apart, through which the grease oozes, while the degreased cake is extruded through a discharge orifice as sheets which become hard and brittle on cooling. The grease, while still warm, is filtered through a filter press. The cake is then powdered in a hammermill. The meal so produced would make a good stock food were it not deficient in vitamins; probably use for fertilizer would be more practicable. Of the total dehydrated garbage, 3.9% was driven off as volatile or moisture, 8.4% was removed as grease, and the meal constituted 85.2%.[H31]

### Treating Slaughter House Wastes

A study of slaughter house wastes by a West Virginia commission led to the conclusions that most operators are interested in recovering by-products for which there is a market; that such re-





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covery directly improves the objectionable characteristics of the wastes; and that septic tanks render no appreciable degree of improvement where blood is discharged into them, unless they are of unusual capacity. Reduction of stream pollution can be effected by conservation of water consistent with cleanliness; provision of grease traps; recovery of all possible by-products; and placing of all effluents on farm lands. Where a slaughter house handles 40 hog units or more a day, one of two types of treatment should be adoped: 1—A primary settling tank, percolating filter with ventilated underdrains and dosing tank, and a secondary settling tank. 2—A primary settling tank, dilution tank for mixing filter effluent with settled effluent, circulation pump, high-rate filter, and secondary settling tank. Smaller plants may use a septic tank with a 24 hr. detention time plus a 30-day sludge storage and digestion capacity, with provision for drawing off the sludge. The effluent should pass to dry wells lined with boards or open masonry, or to a subsurface disposal field.[H33]

### *Bibliography of Sewerage Literature*

D *The Surveyor (England)*
*April 4*

19. A New Chart for Highway Sewer Design. By W. Eastwood. Pp. 183-185.

*April 11*

20. Chlorinated Copperas Treatment of Sewage at Kingston-on-Thames. By Edward H. Ellis. Pp. 195-196.
21. The Economic Flocculation of Sewage Colloids. By John Finch and S. L. Wright. Pp. 199-201.

*April 18*

22. Discussion of D 21. Pp. 213-214.

*Engineering News-Record*
*May 1*

5. Housing Construction on Refuse Landfills. By Rolf Eliassen. Pp. 90-94.

G *Water and Sewage Works*
*April*

15. Stabilization in Sewer Construction. By M. W. Loving. Pp. 141-147.
16. Scum Accumulation Responsible for Ruptured Digester. P. 155.

H *Sewage Works Engineering*
*May*

31. Converting Garbage to Feed, Fertilizer and Grease. By W. A. Bush. Pp. 248-251.
32. $14 Millions Pollution Damage in New York State Annually. Pp. 252-254.
33. Slaughter House Waste Treatment by Filters and Activated Sludge. Pp. 255-257.

X *Proceedings, Maryland-Delaware Water and Sewerage Ass'n Year of 1946*

3. Chlorinating the Back River Sewage Works Effluent, Baltimore, Md. By R. J. Trautman. Pp. 1-6.
4. Comprehensive Plan for Collection and Treatment of Sewage in Baltimore County. By G. D. Andrews. Pp. 7-15.

### NYU Honors Lewis V. Carpenter

New York University honored the late Professor Lewis Van Carpenter when it dedicated on May 13, in his name a unique sanitary engineering research laboratory which he helped to build. The dedication was made before a group of outstanding sanitary engineers from the metropolitan area. Following the dedication, nearly 100 engineers and sewage treatment plant operators from the area met and formed the Metropolitan Section of the New York State Sewage Works Ass'n., with Seth G. Hess as chairman and G. W. Symons as secretary-treasurer.

**Mrs. Carpenter Van Dorn, Dean Saville and Prof. Eliassen.**

### Research in Water and Sewage Analysis

The sanitary engineering section of the Civil Engineering Department, Georgia School of Technology, will conduct a three-year project on fundamental research in water and sewage

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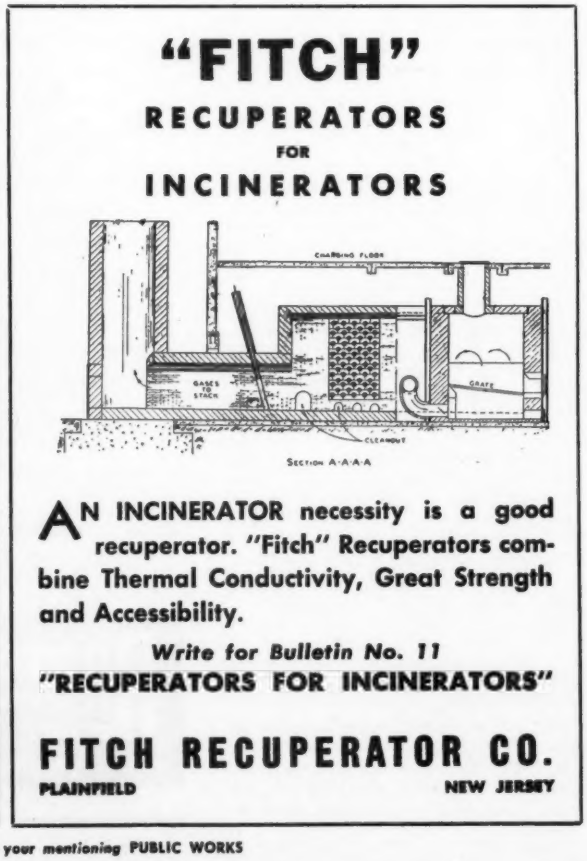

analysis. Development of better methods to coordinate control tests and the operation of water and sewage plants will be of importance to every community. This work is sponsored by the U. S. Public Health Service through the National Institute of Health in one of their first non-medical grants. About $20,000 has been made available for the first year's work.

Dr. Gerald A. Rosselot, Director of the Georgia Tech Engineering Experiment Station, announces that the project will be directed by George W. Reid, Associate Professor of Sanitary Engineering, who will be assisted by Dr. Robert S. Ingols, Research Associate Professor of Sanitary Engineering. Dr. C. E. Renn of Johns Hopkins University will collaborate with Professor Reid in his research.

### A.S.T.M. Standards on Cement.

The 1946 edition of the compilation of "A.S.T.M. Standards on Cement," presents in convenient form the six standard specifications for Portland and other types of cement, gives fifteen standardized methods of testing and also includes considerable supplementary material including: information on analytical balances and weights, a manual of cement testing, a list of selected references on portland cement, and the personnel of Committe C-1 on Cement and its subcommittees. The specification for sieves for testing purposes is also given.

The cement specifications cover the five types of Portland, blast—furnace slag, natural, masonry, and air-entraining for concrete pavements. The methods included cover chemical analysis, compressive strength, fineness, autoclave expansion, sampling, air content, heat of hydration, normal consistency, specific gravity, soundness, tensile strength, and time of setting. Information in the Manual of Cement Testing supplements the standard methods on the physical tests and suggests procedures which should aid in obtaining better uniformity.

*Water Softeners, Hot Process.*—Here is a 68-page technical bulletin (Pub. 3000) which is a near text-book on the subject, with a "Feed Water Chemistry" section in it. Write Cochrane Corp., 17th St. and Allegheny Ave., Philadelphia 32, Pa.

*Mixed Flow Type Pumps* are described in a 24-page bulletin issued by Peerless Pump Division, 301 W. Ave., Los Angeles 31, Calif. The bulletin describes typical and unusual installations and applications and contains cross-sectional drawings, engineering data and sketches of pump station arrangements.

*Protective Coatings.*—Factual information on "Amercoat" covering selection of coating, preparation of surface, and application to steel, concrete or wood; also cost per sq. ft. for materials, area formulas, etc. Amercoat Div., American Pipe and Construction Co., Box 3428, Terminal Annex, Los Angeles 54, Calif.

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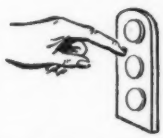

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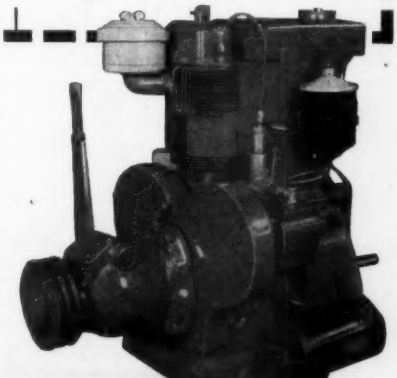

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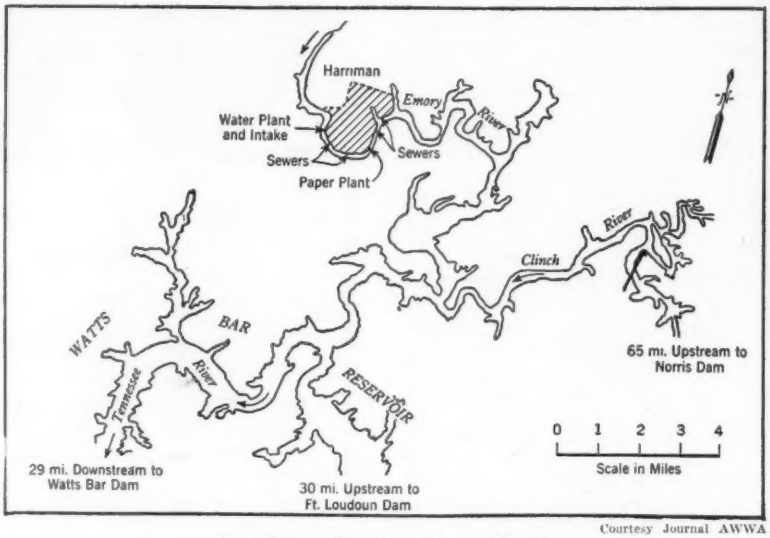
# The Waterworks Digest

## Cost of Trenching

The cost of trenching and backfilling by the Portland Water District in 1946 ranged from 60 cts to $1.49 per foot by hand labor, averaging 96.8 cts; and from 45 cts to $1.05 by machine, averaging 74.8 cts. No rock excavation. Pipe 2" to 8". The soil was clay, sand and gravel. Jobs 60 to 815 ft. long. Machines used: back hoe on 6 jobs, Barber-Greene trencher on 6 jobs, rotary trencher and shovel on tractor on 1 job each.[V4]

## Repairing Main Under 35 Feet of Water

Last December the 16" flexible-jointed pipe carrying water under the East River to Rikers island, New York City, was broken by a dredge at a point where the water was 35 ft. deep and the pipe about 6 ft. below the mud and silt bottom. The exact location of the break was determined by pumping air into the pipe and sending a diver down. He found that a length of pipe had been removed, and an open bell end was looking up at a sharp angle. The bottom was excavated down to the pipe for 36 ft. each side of break, using an 8" air lift. A pair of 18" piles were driven, on opposite sides of the pipe, 4 or 5 ft. back of each open end; which piles supported a 6" H beam directly over the line of pipe, from which the new pipe was suspended in place while the repairs were under way. A length of the same size flexible-joint pipe was cut into two pieces whose combined length was 8" less than the gap between the ends of the pipe to be joined; these two pieces were connected with a solid sleeve, the joint at one end of the sleeve run and calked on land, the prepared pipe lowered into place and the loose end extended sufficiently to bring the spigots into the bells; then the other joint of the sleeve was calked in place under water with lead wire and lead wool alternating to a total depth of 5", and held in place against internal pressure by retaining rings tied together with steel rods. Fifty yards of gravel was then placed under and around the repaired section.[F29]



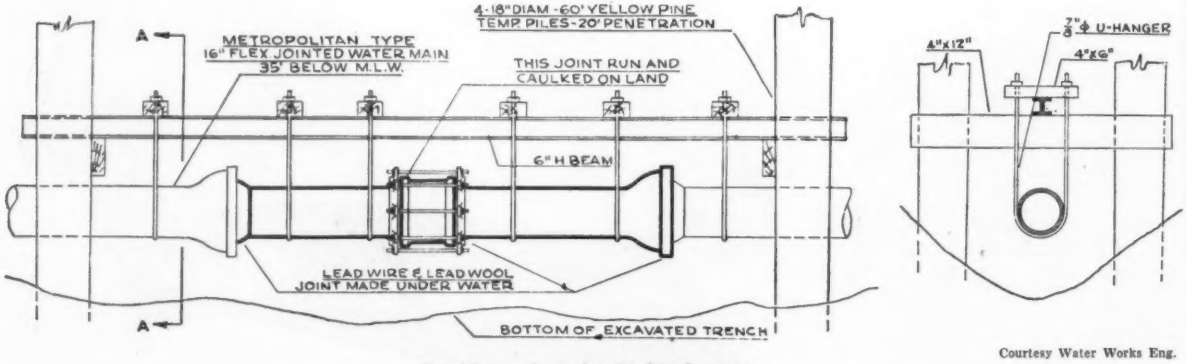

Courtesy Journal AWWA

**Map of Watts Bar Reservoir and Vicinity.**

## Density Currents In Emory River

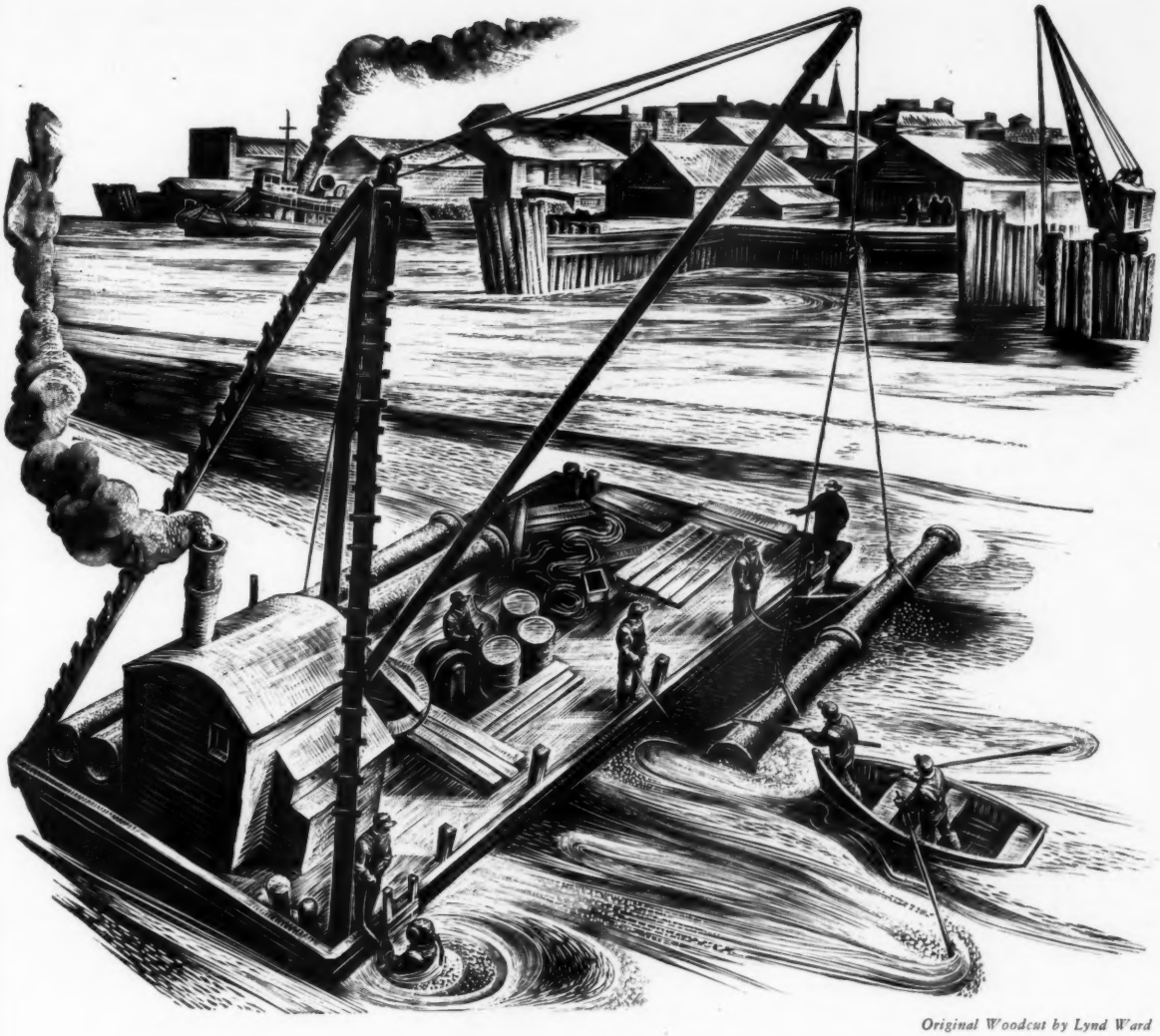
Harriman, Tenn., takes its water supply from the Emory river about 13 miles above its junction with Clinch river and a mile below the extreme upper limit of backwater of Walts Bar reservoir. Emory river is relatively warm during the summer, while the Clinch river water is colder because its flow comes from the bottom of Norris reservoir. When the cold Clinch river enters the warm Emory river, it settles to the bottom and flows up stream while the warm water flows down stream on top of it.

The Harriman intake is in 25 ft. of water, and when the cold water is flowing up stream, the supply is drawn from it; while in winter the entire cross-section of the Emory flows down stream. The city's sewers and the "white water" from a paper mill discharge into the river below the intake and at the bottom of the river, so that when the bottom flow is up stream their polluted water are carried up past the intake. On the other hand when, as cold weather approaches, Emory water becomes colder than Clinch, the latter flows up stream on the surface, then settles and flows down stream on the bottom, past the intake. To meet these conditions, the mill wastes are discharged either at the bottom of the river or on the surface, whichever is moving down stream; and


4-18" DIAM-60' YELLOW PINE TEMP. PILES-20' PENETRATION
A
METROPOLITAN TYPE 16" FLEX JOINTED WATER MAIN 35' BELOW M.L.W.
THIS JOINT RUN AND CAULKED ON LAND
6" H BEAM
LEAD WIRE & LEAD WOOL JOINT MADE UNDER WATER
BOTTOM OF EXCAVATED TRENCH
A
4"x12"
7/8" ϕ U-HANGER
4"x6"

Courtesy Water Works Eng.

**Repairing main under 35 ft. of water.**



*Original Woodcut by Lynd Ward*

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a second water works intake has been constructed taking water from near the surface when the bottom flow is up stream.[A58]

### Corrosion in Deep Well Pumps

Corrosion of deep well turbine pumps may be due to galvanic action, oxygen concentration, carbon dioxide, or electric currents. The rate of galvanic attack is in proportion to the relative exposed area of the cathodic metal to the exposed anodic area; also to the conductivity of the water. Carbon dioxide corrosion takes place at the high pressure points in the pump bowls, inside the column pipe and outside the shaft tube. It is recognized by the occurrence of noticeable pitting at certain points on the guide vanes in the bowls and on the column pipe and the shaft tube just above the bowls.

Galvanic corrosion can be reduced by the use of all-bronze bowls with bronze impellers and stainless steel impeller shaft. The additional cost over cast-iron bowls is about 80% of the turbine unit but only 10 to 20% of the total cost of the installation, and over a 5-yr. period there should be a decided net savings in power costs by a maintained efficiency, and by elimination of replacements and of the necessity for pulling the pump. The column pipe can be protected by coating with baked-on resins, resin-base paints, chlorinated rubber, rubber-base paints, asphalt and coal tar-base paints and lead or lead-chromate base oil paints. The insertion of insulation between the discharge line and the pump head is being used to inhibit or prevent stray current electrolysis. Where there are deposits of iron oxide in the pump bowls or calcium carbonate on the discharge pipe, this can be removed in place by inhibited hydrochloric acid.[G23]

### Cleaning Filters With Sulphur Dioxide

During the 15 yr. that the filters of Rome, Ga., have been in operation they have been treated several times with various chemicals for removing biological slime, and iron and manganese oxides, but with little success until $SO_2$ was used this year. Laboratory tests indicated that a 2% solution of this gas would be most economical and effective. In using it, the filter was first thoroughly washed, the water drawn off thoroughly, and the main effluent header and wash-water valve closed. Then liquid $SO_2$ was applied through the effluent header, the wash-water valve being opened a little at the same time so that the water would carry the $SO_2$ throughout the sand and the underdrain. The solution is then circulated for 24 to 48 hr. by means of a pump attached to the effluent header. The filter then is given at least three back-washings of 5 min. each, leaving the sand free of acid. The cost of treating a 1 mg filter was $97.20, including labor. This treatment not only removes manganese and iron oxide but kills bacteria and plankton and disintegrates mud balls and reaches inaccessible parts of the filter.[G19]

### Salvaging a Standpipe At Negative Cost

When the Bureau of Water of Erie, Pa., asked for bids for removing a 25 x 120 ft. standpipe 35 yr. old, it received fourteen, the highest being $5,500, while one bidder offered to pay $906 for the privilege, including the steel. The low bidder received the contract and paid a subcontractor $2,300 for cutting the standpipe into 3 x 10 ft. pieces. The cutting was done with oxy-acetylene, working from two row boats floating inside the tank.[F30]

### Inactivation of the Virus of Infectious Hepatitis

Hepatitis viruses are found to pass through filters that retain bacteria, survive heating at 56° C for 30 min., and remain active for several years in frozen materials. Treatment of heavily contaminated water with sufficient chlorine to produce a total chlorine residual of 1 ppm after 30 min. contact did not inactivate or attenuate the virus, but treatment by breakpoint chlorination apparently did. Treatment with sodium carbonate, aluminum sulfate and activated carbon decreased the concentration of


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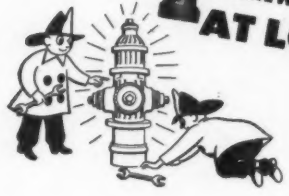

One big, exclusive advantage of Mathews Hydrants is that old ones can be made new—in a few minutes, and at large savings. All it takes to modernize even the oldest Mathews is the modern barrel, for the barrels are interchangeable, and contain all the working parts. Off with the old, on with the new—an easy, above-ground operation—and Mathews 40, 50, 60 and more years old do the same work as today's great, fire-fighting model.

Mathews installed long ago still function perfectly. But conditions have changed, and more is demanded of a hydrant today. By the simple changeover of old barrel to new, communities are converting their old Mathews into the finest of modern types with pumper connections. At the same time they are preserving a large part of their original investment. Let us quote you the low cost at which your community can modernize.

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the virus. Recent studies have shown that the virus is inactivated in heavily contaminated water by coagulation, settling and filtration, and the application of sufficient chlorine to provide, after 30 min. contact, 1.1 ppm of total residual and 0.4 ppm of free residual chlorine. Neither coagulation, settling and filtration, nor chlorination, alone, inactivated the virus.[X22]

### Electric Flocculation

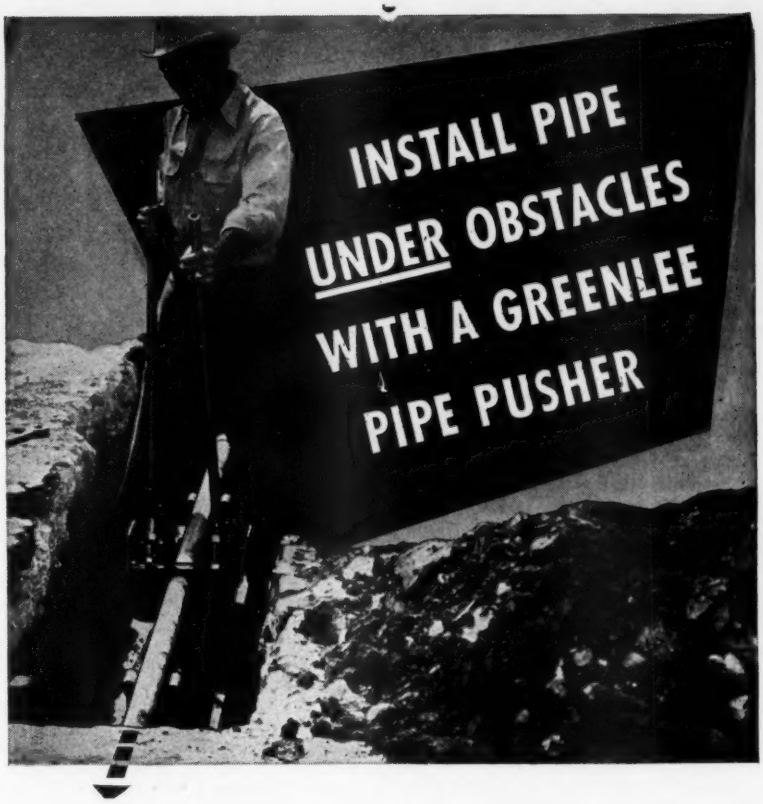
The electric flocculators described in this article consist of electrodes through which the raw water passes. The electrodes are charged with DC current and produce an aluminum hydroxide, which forms a coagulant. The floc is produced by electrical attraction and cannot be broken up even by agitation. Submicroscopic particles are electrically trapped in the colloidal structure. The flow rate through sand filters can be much greater than when using coagulating chemicals alone; it is not affected by low temperature. Slime does not form on the filter walls. Less water is required for backwashing. Silver electrodes are used, losing silver at the rate of one part in ten million; but other types of electrodes are necessary if the water has been chlorinated. The current needed is 1.6 volts with 0.02 amp.[Y7]

### Stream Pollution in New England

In Connecticut, pollution abatement is in charge of the State Dept. of Health and the State Water Commission, which cooperate closely. Both must approve plans for treatment plants. Most of the larger communities and many smaller ones have such plants, and 24 plans have been approved or are in preparation for most of the remaining ones. Work is going on actively in improving the industrial waste pollution situation.[B8]

### Planning Standards in Washington

A 44% increase recently in the population of Washington, D. C., necessitated expansion in every feature of the District's supply system. The principles adopted as a basis for planning the extension include the following: Estimating population growth was predicated upon the special characteristics influencing local growth, the extent of habitable areas, the present densities of occupied areas, the determination of unoccupied habitable areas and the assignment of reasonable future densities. Consumption varies in the different areas according to class of inhabitants, type of dwellings, size of lawns and gardens, prevalence of out-of-town water users, type and extent of commercial users, adequacy and pressure of distribution system, extent of sewerage system and of water-using facilities and climatological conditions. The capacity of the filter plant was taken as the future consumption for the maximum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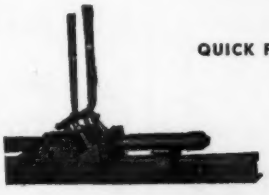

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day plus 25% to meet abnormal conditions. A clear-water basin capacity of 20% of the nominal filter plant capacity was adopted, and a total working and reserve filtered water storage capacity equal to between 75% and 100% of the consumption demand for the annual average day. The ratio of maximum hourly demand to hourly maximum demand on maximum days is 1.6 for the city as a whole, varying from 1.5 to 2.0 for the different service areas.

In determining the sizes of mains 20" and larger, a Williams & Hazen coefficient of 120 was assumed; although straight runs of concrete pipe, cement-lined cast iron and bituminous enameled steel pipe show a coefficient of 135 to 145, the lower coefficient was adopted to allow for loss at bends, valve, tees, etc.

Telemetric communication facilities for rates of flow, reservoir levels and pressures in the various areas will be installed. Because of the great distances of some parts of the distribution system from the filtration plants, supplementary chlorination facilities will be provided for boosting the chlorine residuals in remote parts of the system.[A51]

### Corrosion Due to Algae

Corrosion due to the prolific growth of Oscillatoria algae occurred in open steel tanks in the softening plant of the California Water & Telephone Co. near the Mexican border. Where these algae grow, the pits in the steel are bright and clean because the iron goes into solution instead of producing a protective covering such as an oxide or sulfide. Pitting was worst near the top of the tanks and did not occur at the bottom where lack of sufficient light prevented algae growth. The simplest, least expensive and most effective method of control is to exclude the sunlight by covering the tanks. When this was done, no further corrosion or pitting occurred.[A52]

### Recent Water Supply Engineering

The following items are condensed from the report of a committee of the A.S.C.E. on developments in water supply engineering during 1945-'46.

Of 9 cast iron pipe foundries reporting, all used cement lining of standard thickness and 6 also used thin cement lining. Tar dipping was practiced by 8, and 4 used bituminous coating over cement lining. There are persistent rumors concerning the use of plastics for pipe lining. Reinforced concrete pressure pipe, especially the pre-stressed type, is being used increasingly. About 50 miles of small pipe was cement lined in place during the two years.

In earth dam design, notable trends are extreme precaution against overtopping, more extensive preliminary investigation, and provision for safe discharge of seepage. The rolled fill method of construction is gaining in favor over the hydraulic, largely because of the development of earth handling equipment of greater capacity and speed.

In water treatment, use of chlorine dioxide for taste and odor removal is very promising. Increasing interest is being shown in the de-aeration of water for corrosion control. Some wonder if the child of the future, brought up on heavy chlorine residuals, will regard all chlorine-free water as distasteful.[K2]

### Financing With Revenue Bonds

A new section of the Ohio constitution authorizes municipalities to issue mortgage bonds for acquiring, constructing or extending any public utility, to be "secured only upon the property and revenues of such public utility, including a franchise" for not more than 20 years. Generally, mortgage revenue bonds can not be sold at as low an interest rate as general obligation bonds, not being so generally eligible for investments by banks and fiduciary funds. Their greatest advantage is that they add to the flexibility of a municipal revenue system. They are not subject to either constitutional tax debt or statutory debt limitations. They are not subject to taxpayers resistance to incurring new debts to increase taxes, and a utility is therefore able to carry on necessary expansion with less opposition. They encourage more efficient administration because, if the bonds are to be sold most advantageously, the utility must be on


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a sound business basis; it must be adequately maintained, rates correctly adjusted and sound accounting methods installed.[A54]

## Colorimetry And Photometry

Many of the constituents in waters may be determined advantageously by colorimetric methods. Present instruments seem to be adequate for the necessary measurements. Comparometers are simple, economical and generally satisfactory for visual determination of single-component colored systems. Photometers may be substituted in practically all such work. In addition, by providing greater selectivity, they may enable one to avoid interfering colors. The best spectro-photometers, when equipped with photoelectric receptors, eliminate certain subjective difficulties inherent in visual instruments.[A56]

## *Bibliography of Waterworks Literature*


A *Journal, American Water Works Ass'n*
*May*

63. Water Supply Development in the Northern Republics of South America. By Geo. C. Bunker. Pp. 397-410.
64. Water Supply Activities in Venezuela. By M. Viloria Lugo. Pp. 411-415.
65. Sanitation for the American Forces in Calcutta. By D. C. Teal. Pp. 416-422.
66. Geochemical Alterations in Ground Waters of the Los Angeles Coastal Plain. By Carl Wilson. Pp. 423-429.
67. Water Development Plans in California. By Edward Hyatt. Pp. 430-442.
68. Water Resources and Watershed Management Research in the Southeast. By Joseph A. Lieberman. Pp. 443-454.
69. Watersheds and Reforestation. By Geo. W. Dean. Pp. 455-458.
70. Cause and Prevention of Accidents. By Harold F. Webb. Pp. 459-463.
71. Employee Training and Customer Relations. By E. E. Jacobson. Pp. 464-466.
72. Clinker Remover for Lime Slakers. By A. E. Howell. Pp. 467-469.
73. Value of Hydrant, Valve and Meter Standardization. By George J. Van Dorp. Pp. 470-472.

F *Water Works Engineering*
*April 16*

29. Repairing 16-Inch Main in 35 Feet of Water. By Frank X. Elder. Pp. 404-406.
30. Rowboats Make Platform to Salvage Obsolete Standpipe. By Walter Rudolph. Pp. 407-408, 449.
31. How Privately-Owned Meters Were Purchased at Portland, Me. By George S. Wescott. Pp. 413, 434.
32. Maximum and Normal Demand Days Analyzed at Manchester, N. H. By Percy A. Shaw. Pp. 414, 430.
33. Cleaning and Cement Lining Large Mains in Place. Pp. 415-417.

*April 30*

34. Natural Hot Water Utilized for Household Heating. By H. R. Vinson. Pp. 462-464.
35. Cement Lining Large Mains in Place Using Pneumatic Pressure. Pp. 474, 487.

G *Water and Sewage Works*
*April*

23. Corrosion in Vertical Turbine Pumps. By T. E. Larson. Pp. 117-121.
24. Curve for Determining Flow in Components of Parallel Pipe Systems. By John J. Baffa. Pp. 126-129.
25. The Waterworks Superintendent's Responsibility to His Community. By N. T. Veatch. Pp. 130-132.
26. Why Have Operators in Water Filtration Plants? By A. E. Clark. Pp. 133-134.

J *American City*
*April*

9. How the Wanaque Works. Pp. 86-88.

K *Journal, American Soc'y of Civil Engineers*
*April*

2. Water Supply Engineering: Report of Committee for Two Years Ending Dec. 31, 1946. Pp. 497-521.

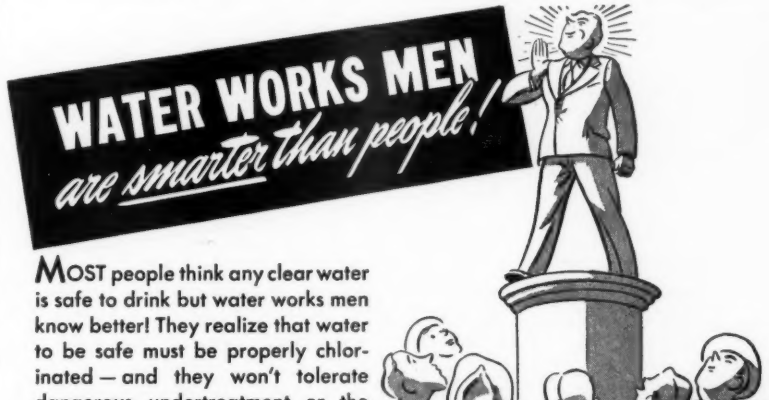
X *American Journal of Public Health*
*April*

22. Inactivation of the Virus of Infectious Hepatitis in Drinking Water. By John R. Neefe, James B. Baty, John G. Reinhold and Joseph Stokes, Jr. Pp. 365-372.

*Proceedings, Maryland-Delaware Water and Sewerage Ass'n*
*Year of 1946*

23. Breakpoint Chlorination for Manganese Removal at Montebello Filters. By S. E. Edwards and G. B. McCall. Pp. 16-22.
24. Use of DDT in the Control of Insect Carriers of Disease With Special Reference to Water Supplies and Sewage. By F. C. Bishopp. Pp. 23-32.
25. Demonstrations of Automatic Water Sampler. By C. V. Swearingen. Pp. 33-35.
26. Application of Diatomaceous Earth Filters to Swimming Pool Recirculation Systems. By James W. Engle. Pp. 36-49.
27. Trends of Construction Costs. By Roy H. Ritter. Pp. 50-57.
28. Operation of a Water Supply System During a Manpower Shortage. By J. M. Jester. Pp. 58-63.



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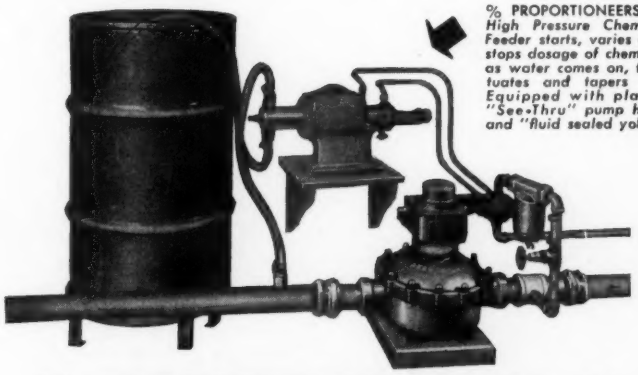

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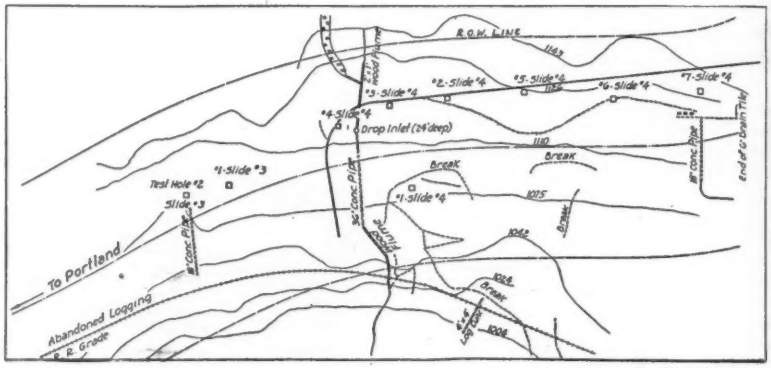
# The Highway and Airport Digest

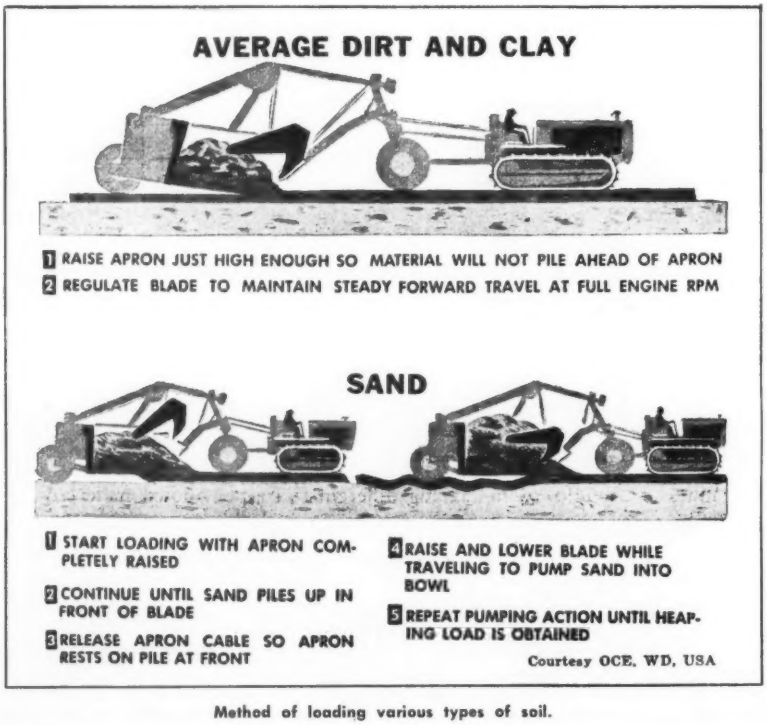
## Controlling Hillside Slides

Controlling and repairing slides has cost Oregon's state highway department $250,000 a year for many years, and it has developed a well-defined method of diagnosis and cure. When a hillside area shows signs of slipping, a contour map is prepared, on which are shown locations of surface breaks, the locations of test pits dug and the elevations of ground water and slippage plane as found at each; and the proposed location of drainage lines or tunnels. Test pits 4 x 4 or 4 x 6 are dug and lined with 2 x 12 lumber, a record being kept of the soil materials passed through and especially of the elevation of the slip plane. (In a recent job the test pits were over 70 ft. deep.) After studying these data, the location of the drainage tunnel and pipe lines is decided upon. In a typical case the tunnel goes into the hill just outside the moving area, then turns and traverses the area parallel to the road, keeping the roof just below the slip plane. The standard tunnel is 4′ wide by 6′ high, timber lined. It is possible that perforated corrugated iron pipe will later be placed in the tunnels, with large stone packed around them, should the timbers show signs of rotting. After the tunnel has been completed, 4″ vertical auger holes are bored at intervals through the ground into the roof of the tunnel, to serve as weep holes. The tunnels cost about $25 a lineal foot, and may be 800 to 1,000 ft. long. But repairing one slide cost $150,000 and kept the road out of service for three weeks.[N44]




Courtesy Roads & Streets

**Map of slide area, showing test holes, drain lines and tunnel.**


AVERAGE DIRT AND CLAY
1 RAISE APRON JUST HIGH ENOUGH SO MATERIAL WILL NOT PILE AHEAD OF APRON
2 REGULATE BLADE TO MAINTAIN STEADY FORWARD TRAVEL AT FULL ENGINE RPM
SAND
1 START LOADING WITH APRON COMPLETELY RAISED
2 CONTINUE UNTIL SAND PILES UP IN FRONT OF BLADE
3 RELEASE APRON CABLE SO APRON RESTS ON PILE AT FRONT
4 RAISE AND LOWER BLADE WHILE TRAVELING TO PUMP SAND INTO BOWL
5 REPEAT PUMPING ACTION UNTIL HEAPING LOAD IS OBTAINED
Courtesy OCE, WD, USA

**Method of loading various types of soil.**

## Bituminous Non-Skid Treatments

To construct a non-skid dense bituminous surface, two methods are in use in England. Where there is heavy industrial traffic, ¾″ chips precoated with bitumen are rolled into the surface prior to final consolidation. By selecting suitable constituents it is possible to design a bituminous mortar which, under the combined action of traffic and weather, will wear away more rapidly than the coarse aggregate, thus retaining a non-skid surface. Also by suitably proportioning the ingredients it is possible to design open-textured surfaces that retain their rough texture for many years under heavy traffic; which type of thin surface may be laid on an existing slippery surface, and at the same time level up irregularities in profile.

For non-skidding existing slippery roads, the cheapest treatment is a surface dressing. If properly laid, such dressings should last 3 to 5 years on suburban roads. For surfacing a hard surface like concrete, a second coat is applied a few days after the first has become well consolidated by traffic. The chips should be hard igneous or siliceous rock.

Where the road surface has become uneven or irregular, an asphalt or tar carpet ¾″ x 1¼″ thick is suitable. Open-textured asphalt carpets have a life of at least 7 yr. on heavily travelled country roads. The aggregate should contain between 10 and 20% passing a ⅛″ sieve. Tar carpets should contain a higher proportion of fine aggregate. For medium traffic trunk roads, a thin

bituminous carpet of fine aggregate and binder, laid cold and consolidated to about ½" thickness, in which closely packed precoated chips are embedded, has given good service. For very heavy city traffic, excellent service has been given by covering the surface with a layer of mastic asphalt and spreading on it powdered rock asphalt and, while it is still loose, 1" stone previously coated with asphalt and completely covering the surface, and rolling the stone so that it is keyed into the rock powder; some rock powder also being spread lightly over the surface.[D15]

### Pennsylvania Shoulder Maintenance

Pennsylvania's Dept. of Highways has to maintain over 27,000 miles of blacktop secondary roads. One of its biggest problems is cutting down high shoulders on secondary roads and building up ruts along the edges of arterial highways. For the former, they cut down the shoulder with a blade and load the material into trucks with belt-type or vertical-lift loaders. In filling up ruts along the pavement edge, granular material is dumped in the rut by a dump truck tail gate and spread by a low-type drag, then consolidated by a 5 or 7-ton roller, and loose material cleaned up with a grader blade. On heavily traveled routes the shoulders are stabilized periodically with stone chips. Incidentally, where a concrete pavement has been widened by adding 1 or 2 ft. of black top, drivers seldom drive over the edge because the contracting color stands out prominently.[N42]

### Minimizing Spring Thaw Damage

Responding to a questionnaire, Indiana reports that it considers it better to allow trucks to damage the roads and concentrate its maintenance on weak spots, than to tie up a long road because of short stretches. West Virginia finds it impracticable to close many of its roads because of the absence of alternate routes. The other states reporting —Minnesota, South Dakota, Michigan and Missouri—all restrict loads on roads during the spring break-up. Publicity is found to be fairly effective. Minnesota, after 20 yr. of publicity, finds that "acceptance of restrictions is slowly but steadily improving." In 1945 it posted 6,924 miles of state trunk highways, or 86% of the gravel and bituminous roads. South Dakota, in addition to posting certain roads, urges that heavy hauling on others be confined to the early part of the day. Michigan is very thorough in its treatment of the problem. Early in March it takes soundings in the subgrades to determine when the frost is beginning to let go; and removes the restrictions only after soundings show that the frost is all out and the subgrade is stable. During the restricted period the roads are patrolled by weighmasters carrying portable scales. The maximum axle loads permitted on pavements of concrete or with concrete base are 13,500

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lb. on pneumatic tires or 12,000 lb. on solid rubber for 9 ft. axle spacing, 72% of this for less spacing; and on other roads 85% to 90% of these loads.[B13]

### Soil Compaction

"The most important step in the construction of an airport runway or highway is the compaction of the base." Three basic methods of compaction have been accepted: 1—weight, 2—vibration and 3—kneading. Weight is contributed by tamping or sheepsfoot rollers and steel drums and discs. Kneading is produced by the wobble-wheel pneumatic roller, by rubber-tired earth moving equipment and by traffic. Granular soils are most affected by weight and vibration; clayey and silty soils by tamping-type rollers.

It is always best to roll with lighter loads than the maximum permissible and to roll faster. The wobble-wheel, pneumatic-tired rollers developed especially to produce traffic-compaction results are ideal for the heavier clay and silt soils when such materials are laid in relatively thin layers.

As yet, no commercial means of mechanical vibration are available which would pay out on any sizable construction job. Tests on mechanical vibratory compaction have revealed, however, that only granular soils respond, limiting the use of this type of compaction.[O28]

### Subgrade Treatment To Prevent Pumping

This article gives in detail the conclusions derived from a study of seven test sections of concrete pavements laid in 1937. "The extrusion of fine-grained subgrade materials from beneath concrete pavements by pumping action is a major cause of a large portion of the failures." Such action occurs only when there is a combination of fine-grained subgrade soil, wet subgrade conditions and heavy traffic loads. The experimental sections included base courses constructed with sand, stabilized material, treatment with limestone dust, treatment with tar, emulsified asphalt and liquid asphalt, and saturating the subgrade with water. Performance data indicated that granular base-courses contributed the most to improvement of the pavement performance, the result of their use being a pavement of nearly as good a riding quality today as at the time of construction nine years ago. The mixing of bituminous materials with the fine-grained subgrade soil improved the pavement performance but not as effectively as did the granular base-courses. No significant difference was readily apparent in the pavement performance on the bituminous-treated sections, although all three treatments improved the performance in comparison to untreated sections. Water saturation appeared to have no value.[O27]

### *Bibliography of Highway and Airport Literature*

D *The Surveyor (England)*

*April 18*

14. Highway Design in Relation to Road Accidents. By G. T. Bennett. Pp. 211-212.

*April 25*

15. Non-Skid Bituminous Treatments for Road Surfaces. By R. R. Lee. Pp. 219-221.
16. Modern Road Construction in Concrete. By. W. P. Andrews. Pp. 225-226.

*Engineering News-Record*

*May 1*

31. Putting Soils Knowledge to Work on Airfield Runways. By Elwyn E. Seelye. Pp. 67-71.

J *American City*

*April*

4. Build Quality Into Ashpalt Streets. By Charles A. Mayer. Pp. 99-101.

N *Roads and Streets*

*April*

40. Developments in Soil Mechanics. Pp. 54-55.
41. Compaction—How States Specify It. Pp. 55-59, 62.
42. Notes on Shoulder Maintenance. By Warren K. Myers. Pp. 60, 125.
43. A Highway Builder Looks at Highway Engineering. By Dwight W. Winkelman. Pp. 64, 66, 70, 92.
44. Curing Slides With Drainage Tunnels. Pp. 72, 74, 76.
45. Pavement Striping Methods. Pp. 78, 80, 82, 84, 86, 88.
46. Surface Heaters and Heater-Planers. By L. Miller. Pp. 101-103.

O *Roads and Bridges*

*April*

27. Effect of Subgrade Treatments on Pavement Faulting and Pumping. By E. A. Henderson and W. T. Spencer. Pp. 81-87, 106.
28. Soil Compaction Essential to Good Paving Results. By A. O. Williamson. Pp. 93-94, 118.

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29. New Method of Removing Snow from Airports. By J. R. Shannon. Pp. 95-96, 120.

R *Better Roads*

*April*

11. Maintenance: Enduring Road Task. By C. L. Motl. Pp. 23-24, 35.
12. Winter of the Big Snow Campaigns. By Ralph F. Swan, E. Fladmark, C. E. Shumate. Pp. 27-30.
13. Holding Down Spring Thaw Damage. Pp. 32-34.
14. Asphalt Subsealing in California. P. 46.

## For the Engineer's Library

*Diesel Engines and Power Units* are described in two new 8-page pamphlets issued by International Harvester Co., 180 N. Michigan Ave., Chicago, Ill. These include performance charts, power curves and much other technical data.

*Small Diesel Engines* are discussed and described in Catalog No. 11 of the Witte Engine Works, Kansas City 3, Mo. This is an interesting text on diesels and their various applications; 4, 6, 9 and 12 hp. engines and the various dieselectric plants are covered.

*Heavy Duty Trucks.*—This folder describes 10-ton and 12-ton trucks. Four Wheel Drive Auto Co., Clintonville, Wis.

**Harnischfeger** Corp., Milwaukee, Wisc.; a 28-page booklet describing P&H *grab bucket cranes* in a variety of sizes, with particular reference to handling of garbage and refuse. Ask for Bulletin C9-1.

*Hoisting Equipment.* — American Hoist & Derrick Co., St. Paul 1, Minn., has issued a new 28-page catalog covering their entire line of equipment.

*Earthmoving.*—R. G. Le Tourneau, Inc., Peoria, Ill., has issued a 12-page folder of actual job records, based on experiences of 8 major contractors on 25 completed projects. Ask for G-1073.

*Portable Air Compressors.*—Series 80 compressors incorporating many modern developments are available in seven sizes ranging from 60 to 630 CFM. Either gasoline or diesel power and several styles of mountings can be provided for many of these sizes. Details in bulletins from Sullivan Division, Joy Manufacturing Co., Michigan City, Ind.

*Shovel Dippers.*—Here is a 32-page book wholly devoted to dippers—shovel, pull-shovel, dragline and clamshell. A lot of information in it that may save you money. Ask for All Purpose Dipper Booklet, Pettibone Mulliken Corp., 4700 W. Division St., Chicago 51, Ill.

*Tracks, Rubber or Both.*—An 8-page booklet tells the uses and applications of track-type tractors, wheel-type and motor graders. Caterpillar Tractor Co., Peoria, Ill.

*Diesel Motor Graders* and their applications are described in a booklet, "Contractors Profit with Caterpillar Diesel Motor Graders," issued by Caterpillar Tractor Co., Peoria, Ill.

*Rock Drills.*—A new line of cadmium plated rock drills has been introduced by the Sullivan Division, Joy Mfg. Co., Michigan City, Ind. Greater drilling speed, better lubrication and increased protection are claimed for inside-and-out cadmium plating. Four-page illustrated pamphlet.

*Topographic Surveys From the Air.*—A publication describing how large areas of ground can be surveyed from the air and topographic maps made to 2′, 5′, 10′ or 20′ contours from aerial photographs at a considerable saving over the cost of conventional ground surveys has been issued by the Aero Service Corporation, 236 E. Courtland Street, Philadelphia 20, Penna. The publication is a symposium or articles by well known highway officials describing how this type of contour map developed from aerial survey photographs has been used with economy of money and time in determining the most feasible location for highways. The same basic method is applicable to flood control, reservoir surveys and many other purposes.

*Bulldozer-Shovel.*—A new combination Bulldozer-Shovel, Model 9-A, has been developed by the Frank G. Hough Co. of Libertyville, Ill., for use with the International T-9 and TD-9 TracTracTor. This dual purpose unit, operated entirely by hydraulic control, may be equipped with either a full track width 1-yd. bucket or bulldozer blade. *(Add to Chapter 1, Highway and Airport Manual)*

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# PUBLIC WORKS Equipment News

**The Proportioneers de luxe trailer.**

### New Trailer for Proportioneers

The new demonstration trailer of Proportioneers, Inc., Providence, R. I., has started for the AWWA-FSWA convention. On the way to San Francisco, the trailer will visit Albany, Niagara Falls, Detroit, Chicago, St. Paul, Des Moines, Omaha, Denver and Salt Lake City. This unit contains many pieces of new and interesting equipment.

### Trench Roller With Leveling Wheel

All-Purpose Spreader Co., Box 105, Fuller Road, Elyria, O., has a pneumatic tired leveling wheel trench roller

**Apsco trench roller.**

which will not skid against forms nor when loading on a trailer or a flat car. The leveling wheel can be raised or lowered whether the roller is in motion or standing still. The compression per lineal-inch of roll face can be varied from 180 to 300 pounds. Sprinklers and scrapers are furnished for the front and rear rolls. Air or mechanical clutches and 2 speed transmission are standard.

### Truck-Mounted Shovel Speeds Work of Water Department

The Denver, Colo., Municipal Water Works recently purchased a Quick-Way shovel operated with an International power unit. This shovel has been most useful in digging ditches, handling pipe, backfilling and similar work, including reservoir maintenance. Since it is truck-mounted, it can travel to reservoirs as far distant as 100 miles. The bucket is 0.4 cu. yd.; the shovel trenches to a depth of 3½ ft. and lifts to a height of 11 ft.

### Power Products Corp. Gasoline Engine

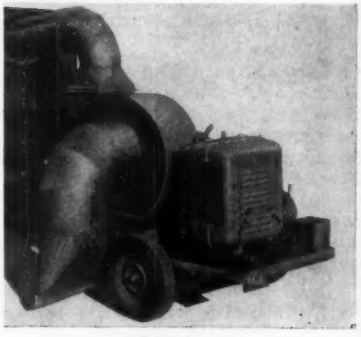
A new light-weight compact gasoline engine has been developed by Power Products Corporation of Grafton, Wisconsin. The one horsepower engine, 8½" x 11" x 14½" in size, weighs only 16 pounds and was designed for manufacturers of compressors, pumps, flood lights, lawnmowers, bicycles, airport service, and portable and self-propelled equipment.

Emphasis has been placed on compactness, so that the engine will take up a minimum of space. Other features include smoothness at all speeds, easy starting, (at all temperatures), minimum noise and vibration and good operation at any tilt up to 45 degrees. The engine is a 2 cycle, air cooled design. Aluminum castings and stampings are used throughout, except for piston rings, cylinder sleeve, crankshaft, bearings, etc.

**Quick-Way, IHC powered shovel, used at Denver.**

### Saves Money When the Leaves Begin to Fall

The Leaf Loader Division of the American Structural Steel & Tank Co., 20216 John R, Detroit 3, Mich., make a leaf loader that will cover from 4 to 6 miles of streets in an average day and should pay for itself in one season. This is similar to an oversized vacuum



**Leaf loader unit.**

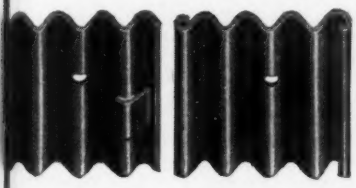
cleaner; it picks up all leaves wet or dry, from the streets; these are passed into a truck for hauling away. A screened enclosure on the truck permits an oversize volume of leaves to be carried.

### Gerlitz Sales Manager for Simplex

Frank E. Gerlitz has been appointed sales manager of the Simplex Valve & Meter Co., Philadelphia, Pa. Mr. Gerlitz prior to coming with Simplex in 1941 had a wide experience in water and sewage treatment plant design, and also was with the Pennsylvania State Board of Health.

### Caine Steel Piling Now 25% Stronger

Caine Steel Co., Steel Piling Division, 1820 N. Central Ave., Chicago 39, Illinois, now rolls its corrugated



Caine steel piling.

steel piling from a new alloy which is 25% stronger than that formerly used; for equal strength the new piling can be 25% lighter. The new alloy also has a much greater corrosion resistance and correspondingly longer life.

### Hydraulic Road Sander Has Many Desirable Features

The Hydro Spreader Corp., 2101 W. Purdue St., Milwaukee 9, Wisc., has developed a hydraulic road sander for use on icy or snowy streets. It can be attached to the rear of a dump body truck and is operated by a power take-off. A portion of the grit is thrown ahead of the rear wheels to provide traction for the truck. Speed of the rotating distributor can be increased or decreased as desired and the amount of grit thrown can be changed immediately. Brick, stone or other obstructions will not injure the unit, though it may stop it, as a pressure relief is provided. This sander can also be used for seal coating black-top pavements.

### For Excavating, Grading, Street and Highway Work

Trackson Co., Milwaukee 1, Wisc., has announced the Model T6 Traxcavator, 1½ to 1¾ yd. capacity, which will strip, level and subgrade, load materials and perform similar kinds of work. It combines many of the useful features of a shovel, loader, scraper and bulldozer. It is briefly described in Form 977.

### A Power Grader That Does a Lot of Things

Meili-Blumberg Corp., New Holstein, Wisc., has a new power grader which they tell us has these advantages: Fast—2 to 16 mph.; hydraulic power on the moldboard; all controls on operator's platform; 12x38 low pressure tires; 40 hp. International power; attachments include broom, snow plow, scarifier, bulldozer blade; all-weather cab. Ask for Bulletin 134.

### Motorola Inc. Is New Name of Galvin Mfg.

The corporate name of the Galvin Mfg. Corp. has been changed to Motorola Inc. The corporation, which makes Motorola car heaters and radios, is located at 4545 Augusta Blvd., Chicago 51, Ill.

HIGHWAYS
CURBS
CURB AND GUTTER
SIDEWALK
AIRPORT

The heavy duty highway and airport forms have several exclusive Heltzel features . . . 2½" tread . . . up-turned base flange — 50% additional strength . . . extended lock joint guide . . . hot pressed ¼" lock joint — V type eliminates clogging . . . non-clogging single wedge stake pockets that are not affected by vibration. The base flange is also drilled for auxiliary stakes or bolting on risers. The $\frac{7}{32}$" form is recommended for all construction up to 20' widths. The ¼" form is recommended for construction over 20' in width. Both forms meet all highway specifications.

Heltzel also has steel forms for curb, combined curb and gutter, sidewalk, rigid radius and flexible radius.

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Heltzel Steel Form & Iron Company, Warren, Ohio

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*(Type of construction usually engaged in)*

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*When you need special information—consult the classified* READERS' SERVICE DEPT., *pages 69-73*

Pioneer Two-Unit plant used by E. W. Coons Co.

### Pioneer Two-Unit Crushing and Screening Plant for Airport and Highway Work

The E. W. Coons Company of Hibbing, Minnesota, uses a Pioneer Two-Unit plant to crush and screen gravel for highway and airport work in Northern Minnesota. The plant consists of a No. 150-PG primary, which has a 1536 jaw crusher and 4' x 6', 1½ deck vibrator screen mounted on a three axle chassis; and a No. 140-S secondary with a 40 x 22 roll crusher and 4' x 10', 3½ deck vibrator screen also on a three axle chassis. A swivel conveyor to the primary is shovel fed from the gravel bank. Sand is rejected at the primary, but separation of sand and intermediate crushed stone can be made while producing aggregate or road material. The plant is powered by a Caterpillar D-8800 on the primary and a Caterpillar D-13000 on the secondary.

### New Ribbed Gasket to Prevent Leaks

A. P. Smith Mfg. Co., East Orange, N. J., has developed a new lead gasket with raised preformed ribs for use on bolted tapping sleeves. This new gasket is designed to insure a permanently tight and leak proof joint and will be furnished on all Smith bolted tapping sleeves.

### Allis-Chalmers Public Works Equipment

An insight into the type of equipment supplied sewage plants, water works, municipal power plants and other public works is contained in a 20-page bulletin available from Allis-Chalmers Mfg. Co., Milwaukee, Wisc. It includes centrifugal pumps, butterfly valves, blowers, compressors, motors, turbines and highway and processing machinery.

### New Controls for Pump Protection

**This is a new unit which can be used for protecting deep well turbine pumps from lowering of the water table; and for any type of pump against any form of trouble. The Protectrol is mounted in the pump house and connected to the pump discharge. If the pump ceases to discharge for any reason, whether lack of water, impeller** section failure, etc., the Protectrol sounds an alarm and locks the pump out of operation until manually reset. And if the trouble has not been corrected, it will again repeat its operation. This unit is manufactured by Automatic Control Co., 1005 University Ave., St. Paul 4, Minn. Ask for bulletin T-1130 and T-7.

### Save Money on Small Jobs With An All-Hydraulic Truck Crane

The Milwaukee Hydraulics Corp., 7923 W. Greenfield Ave., Milwaukee, Wisc., has announced the first of its post-war units, the H-2, 2-ton Hydrocrane. This unit is radically new in that it employs hydraulic control for every operation, eliminating all gears, clutches, brakes and drums. It can be

Smith ribbed gasket.

mounted on 1½-ton trucks or on special 6x6 drive Jeeps. For clamshell service, a standard ¼-yd. bucket or a special low headroom bucket can be provided. This crane is especially designed for small jobs, formerly requiring hand labor or where larger units had to be used at higher costs. It is especially adapted to county, street and water department use, as for laying water or large sewer pipe. Full details in Form 1000.

### Low-Melting, High-Strength, Silver Welding Alloy

A welding alloy that will provide high strength welds on ferrous and non-ferrous metals at an exceedingly low melting point has been developed. It is called Eutecrod. It is applied b oxyacetylene torch, furnace, or hig frequency induction heating equipmen it bonds at base metal temperatures o 940°-1120° F, and melts at 1143° F At this temperature, it will flow freel into close-fitting joints due to its ex tremely high capillary action. In addi tion, weld deposits will have a shea strength of 120,000 psi., good corro sion resistance and good electrical con ductivity.

This welding rod is available in rod wire, strip, and powder form. It is use with Eutector flux 1801. Further in formation from the Eutectic Weldin Alloys Corporation, 40 Worth Stree New York 13, New York.

### Swimming Pool Filters and Method of Iron, Silica and Manganese Removal

Three new bulletins have been issue by Liquid Conditioning Corporation 114 East Price St., Linden, N. J. Bul letin 8 covers swimming pools, 7 cover silica removal and 6 covers iron an manganese. These publications explai processes, show diagrams and state de sign principles.

### Guide to Faster Floor Repairs

A clear, concise description of how make floor repairs without tying u important traffic or working areas contained in a new folder describin Stonhard "Stonfast," a material that ready for heavy-duty service immediatel after installation. This folder illustrat and describes precisely how Stonfast used. This informative guide can be ob tained from Stonhard Co., 403 N. Broa St., Philadelphia 8, Pa.

### Osgood 1¼-Yard Shovel With Al Control

The Osgood Co., Marion, O., ha announced a new 1¼-yard powe shovel, Type 71, which has air contr and air-cushion clutches. It is made a either a crawler or wheel-mounted ma chine, and is available as shovel, drag line, clamshell and backhoe. Full de tails of this new machine are presente in Bulletin 4633, which contains 1 pages and is well illustrated.

### Self-Propelled Shovel Unit

Lessmann Mfg. Co., Des Moines 4, Ia has a unit which provides for separat application of power for the two pri cipal functions of a power shovel. Th loader is designed, with the tractor, operate as a unit. Full information a folder which will be sent on reques *(Add to Chapter 1, Highway Manual.*

### Nichols Monohearth Incinerators for Toledo

The city of Toledo, O., has awarde a contract to Nichols Engineering Research Corp., New York, for insta lation of two Monohearth mechanical stoked incinerator units.

## FOR THE ENGINEER'S LIBRARY

*Pulsing drives,* whereby electric motors are controlled by a small knob, are described in a publication by Yardeny Laboratories, Inc., 105 Chambers St., New York 7, N. Y.

*Blowers and compressors* are described in A-B-C methods in a 16-page booklet especially designed for student training. Curves and highly illustrative sketches are used effectively. Write Allis-Chalmers Mfg. Co., 677, Milwaukee 1, Wis.

*Planning St. Paul for Better Living,* a publication of the City Planning Board of St. Paul, Minn., 32 pages, well illustrated. Discusses what is planning; your neighborhood and your section; downtown needs; transportation; danger signals; target for today and other important and instructive data. Excellent.

*Acid-Resisting Flanged Pipe* is covered in a new bulletin by Duriron Co., Inc., Dayton, O., which contains most complete engineering data on this subject involving duriron and durichlor pipes; how useful high-silicon cast iron pipe is for corrosive solutions and how to install it.

*Temperature and High Pressure Flow Rate Instruments.*—Data on the selection, design and dimensions of a variety of flow rate instruments for high operating pressures and temperatures; also recording, controlling, integrating, remote and close coupled instruments. Fischer & Porter Co., Hatboro, Pa.

The new 3½-S Kwik-Mix.

*Portable Mixer.*—The illustrated 3½-S mixer features labor saving design. Described in Bulletin KM244, Kwik-Mix Co., Port Washington, Wis.

*Treated Lumber.*—Wolmanized lumber and flameproofed lumber are treated and described in a new bulletin issued by American Lumber & Treating Co., 332 So. Michigan Ave., Chicago, Ill.

*Cables* of various kinds, and *wire* are described and specifications given in four bulletins published by Hazard Insulated Wire Works, Wilkes-Barre, Pa.

*Insulated Pipe Units,* prefabricated, is an excellent 16-page booklet issued by the Ric-Wil Co., Cleveland, O. This will be of much value to engineers and architects as it contains full specification data, tables of dimensions for one or more conduits in a trench, maximum capacities and many other details.

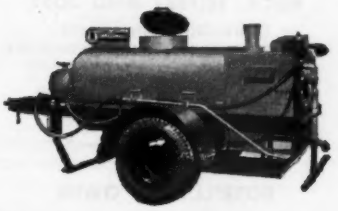
***Relief valves:*** The Cochrane Corp., Philadelphia 32, Pa., publication 4150, describing multiport relief valves. Applications are shown and sizing data, with tables and information on valve selection. Sent on request.

*Diesel Power.*—This is a typical fine Caterpillar booklet, devoted primarily to earthmoving field applications. 16 pages; color; illustrations. Ask for Form 9547, Caterpillar Tractor Co., Peoria, Ill.

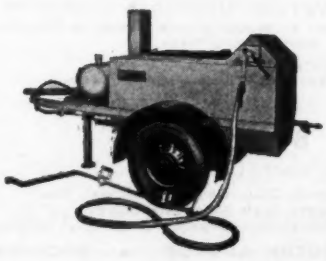
A biography of George Westinghouse has been published by the Westinghouse Editorial Service, 306 Fourth Ave., Pittsburgh, Pa.; 36 pages, illustrated in color.

*"More Power to U.S.A."* is a new 32-page bulletin by Allis-Chalmers Mfg. Co., Milwaukee, Wisc., which presents Allis-Chalmers equipment for power generation and distribution, ranging from steam and hydraulic turbines, turbo generators, engine type generators and condensers and auxiliaries to pumps, water conditioning, motors, motor control, switchgear, circuit breakers, power and distribution transformers and unit substations.

**Holes in black top are as inevitable as winter, and the best and cheapest way is to get on them quickly with the finest repair equipment anywhere available — Littleford. Put Littleford's Trail-O-Roller on patch work and the holes will soon disappear. For this compact little number is motorized and portable, converts from rolling to traveling, or back, in two minutes; trails as fast as you drive a truck; compaction as great as five ton tandem! *There's* efficiency! Combine that with Littleford heating Kettle and 101 Utility Spray Tank, and you're ready for the toughest road job that winter can throw at anybody!**



**Littleford 101 Utility Spray Tank is combination of three units: Spray bar for spraying, hand spray for patch work, pouring pot outlet for filling cracks.**



**Littleford 84-HD is fastest heating kettle made; double heat circulation and screened reservoir. These patented features give fast, efficient, economical operation.**

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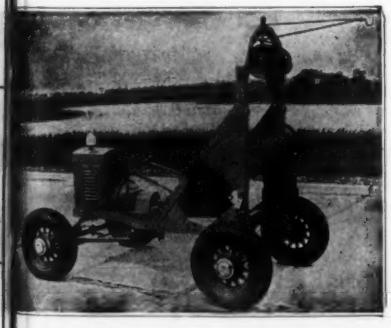
# KEEP THOSE SEWERS OPEN!



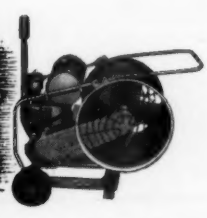
Sewers clogged with sand, roots and other debris are a constant danger to public health and safety. New installations rapidly lose their efficiency due to sand seepage.

You positively can keep the sewers of your city open with an OK Champion—the cleaner that does the entire job from street level. Dig-ups practically a thing of the past.

*Three Distinctive Models Available. Write Now for Literature.*

**CHAMPION CORPORATION**
**4752 SHEFFIELD AVENUE, HAMMOND, INDIANA**

*New Type*
**HERMAN NELSON PORTABLE VENTILATOR**
(With blow-through or draw-through action)



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## CONVENTIONS AND TECHNICAL MEETINGS

### American Water Works and Federation of Sewage Works Associations

The 67th annual conference of the American Water Works Association and the 20th annual meeting of the Federation of Sewage Works Associations will be held in San Francisco, Calif., July 21 to 25. The technical programs of both meetings have been essentially completed, but it is possible that some changes may be necessary in them before the date of the meetings. Harry E. Jordan of the AWWA and F. W. Gilcreas of the FSWA (St. Dep't. of Hlth., Albany, N. Y.) are handling the technical programs.

It is understood that all exhibit space has been taken and that those attending the joint meeting will see a regular pre-war type exhibit of post-war materials and equipment.

The Virginia Industrial Wastes and Sewage Works Assn. will meet at the Nansemond Hotel, Ocean View, Va., Oct. 16 and 17. A. H. Paessler, 815 E. Franklin St., Richmond, Va., is secretary.

The American Road Builders' Association has abandoned plans for a Road Show in Feb., 1948, and will have a summer outdoor Road Show at Soldier Field, Chicago, July 16-24, 1948.

The American Public Health Association will hold its 75th annual meeting at Atlantic City, N. J., Oct. 6 to 10, 1947.

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The Institute of Traffic Engineers will hold its 18th annual meeting at Hotel Fort Shelby, Detroit, Mich., Oct. 1 to 4, 1947.

### Industrial News, Representatives and Equipment Dealers

State Equipment Co., Harrisburg and Wilkes-Barre, Pa., has been appointed distributor by Barber-Greene Co., Aurora, Ill.; Townsco Equip Co., Oklahoma City, Okla., has been appointed exclusive distributor for Oklahoma.

L. S. Luther & Co., 1018 18th St., N. W., Washington, D. C., has been appointed distributor for Liquid Conditioning Corp., Linden, N. J.; William Lovejoy, 1366 Holmesdale Road, Jacksonville 5, Fla., has been appointed representative for Florida.

H. M. Hammond, formerly general sales manager, and P. S. Dickey, former chief engineer, of Bailey Meter Co., Cleveland, Ohio, have been elected as vice-presidents of the firm.

W. A. Riddell Corp. announce that the Hercules Roller Co. has been dissolved. Riddell purchased this company in 1944, and since then have continued manufacture of improved types of 3-wheel rollers.

*George Malvese & Co.*, Jericho Turnpike, New Hyde Park, L. I., N. Y., has been appointed by the *Le Roi Co.*, Milwaukee, Wisc., as distributor for Kings, Nassau, Queens and Suffolk Counties, N. Y.

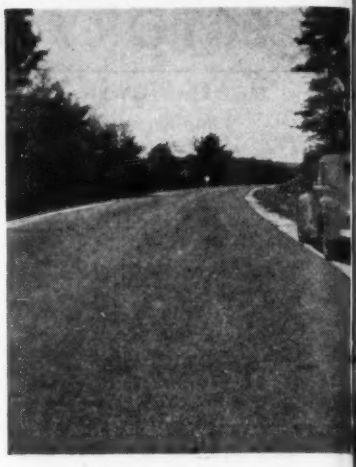
*O'Kelly Myers*, formerly Senior Division Engineer with the Board of Water Supply of New York Cty, is now Resident Manager for Buck, Seifert and Jost, consulting engineers, with headquarters in the City of Guayaquil, Ecuador, where he is engaged on investigations for a new water works system to serve the City.

*Graver Tank & Mfg. Co., Inc.*, East Chicago, Ind., has purchased the tank business of Banks Moreland, Houston, Texas, and will conduct it as a division of Graver.

*Edward W. Hartman* has been appointed District Representative in the Ohio area for the Clay Sewer Pipe Association, Inc. His headquarters are located at the main office of the association, 1105 Huntington Bank Bldg., Columbus, Ohio.

*Underground Pipe Line Conduit.*—Booklet 461, describing Therm-o-tile, includes specifications, methods of waterproofing, methods of installation and instances where its use is of particular value. The insulation is surrounded by air and is kept dry. H. W. Porter & Co., 25 Frelinghuysen Ave., Newark, N. J.

*New Blackhawk Porto-Power Catalog* describes uses of all-directional Porto-Power hydraulic jack equipment and pipe benders for maintenance, production and laboratory work. Write Blackhawk Mfg. Co., Milwaukee 1, Wis.



A well-maintained New Hampshire highway.

### Dimensions and Specifications for Clay Products

A recent publication of the Robinson Clay Products Co., Akron, O., gives dimensions and specifications for sewer and drain pipe and other clay products used in construction.

### Bitumastic Cold-Applied Protective Coating

Wailes - Dove - Hermiston Co., Westfield, N. J., has developed a new type of black, cold-applied, protective coating for metal or masonry. It is a dispersion in water of highly-refined coal tar pitch and other materials. It can be applied by brush or spray; is virtually incombustible; and does not sag or flow at temperatures below 500°. It can be applied to damp surfaces.

## BOOK REVIEW

*Laboratory Control of Water Purification.* By Charles R. Cox, Case-Shepard-Mann Pub. Corp., New York. 386 pp.; illustrated $4.00.

This book "is designed for use by the man who is responsible for maintaining the purity of a public water supply but who has received little or no special training in the work." It "has been organized to present the functional application of laboratory procedures to the control of water supplies." The various laboratory procedures have been grouped under taste and odor control, coagulation, flocculation, sedimentation and filtration, chlorination, softening, iron and manganese removal, corrosion control and bacteriological tests of sanitary quality.

Unfortunately, there is no index, so it is hard to locate specific items, though the division into 24 relatively short chapters helps; but anything Charles Cox writes about water treatment is worth reading and will help anyone who reads it.

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4. Specifications and full information about the new M-M wheel tractors in sizes 27 HP to 49 HP. Send for copies today. Dept. PW, Minneapolis-Moline Power Implement Co., Minneapolis, Minn.

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### Travels Fast, Loads All Kinds of Materials Quickly

22. New Eagle Truck-Mounted Loader, operated by truck driver, goes from job to job at truck speed. Loads all kinds of material quickly. No costly working parts. Ask for new bulletin PW. The Eagle Crusher Co., Inc., Galion, Ohio.

### Solve Your Drainage Problems This Easy, Permanent Way

70. Useful new 60 page catalog on standard corrugated pipe, multi-plate pipe and arches and 18 other drainage and related products for culverts, sewers, subdrains, flood control, airports, water supply and other types of construction. Ask for "Armco Products for Engineering Construction," Armco Drainage and Metal Products, Inc., Dept. PW Middletown, Ohio.

### Improve Appearance of Curbs, Gutters, Sidewalks

78. Curb and Gutter and Sidewalk Forms, including battered face curb form especially for modern traffic conditions. Last 20 years or more. Send for new engineering data Bulletin A-20-F, Dept. P.W., Heltzel Steel Form & Iron Co., Warren, O.

### Handle All Kinds of Tough Grading Jobs Economically

98. The Austin-Western 99M Power Grader with its powerful all wheel drive handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow ploughing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Dept. P.W., Austin-Western Co., Aurora, Ill.

### Save Money, Busting, Cutting, Digging, etc.

110. Powerful self-contained gasoline hammers illustrated in new booklet. Used as paving breakers and spike drivers. Easily portable, economical. Write Syntron Co., 660 Lexington, Homer City, Pa.

### Methods of Installing Steel Sheet Piling

112. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Steel Co., Dept. P.W., 1820

### Reliable Every Purpose Pumps

117. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

### Got an Earth Moving Problem?

126. Write Gar Wood Industries, Dept. PW, Wayne, Mich., on their two and four wheel scrapers, bulldozers, dozecasters, rippers, hoists and bodies, power shovels, spreaders, finegraders and ditchers.

### For Reliable Low-Cost Light and Power Anywhere

392. 20-page catalog P.W. describes "Dieselectric" plants 3 to 10 KVA, and diesel engines from 4 to 12 H.P. These are easily transported and will produce reliable, low cost light and power anywhere. Write WITTE ENGINE WORKS, Division of Oil Well Supply Company, Kansas City 3, Mo.

### Tandem Roller with Air Clutches Starts and Shifts Easier

515. Finger tip steering, air clutches, full visibility all around, low center of gravity, handy location of key parts, all gear drive are features of new Apsco tandem roller. Write for bulletin: Dept. PW, All Purpose Spreader Co., Fuller Road, Elyria, Ohio.

### The 32 Basic Advancements in the New Ford Trucks

522. Beautiful new catalog explains the 32 basic advancements of the new Ford trucks. Gives engine specifications. 138 pictures show special features of engines, chassis and some body models. Send for your copy. Truck and Fleet Sales Dept., Ford Motor Company, Dearborn, Mich.

### Air Cooled Engines for Hundreds of Applications

524. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "night" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wisc.

### Data and Pictures of Complete Line of New Ford Trucks

532. Full line of new Ford Trucks for 95% of all hauling needs is pictured in colorful circular—Light Duty, One-Ton, Heavy-Duty and C. O. E. trucks. Also 48 out of over 100 standard, factory built chassis and body combinations. See before you buy. Write for your copy now. Truck and Fleet Sales Dept., Ford Motor Co., Dearborn, Mich.

### New Type Portable Ventilator Blows Or Draws

535. Light weight, high powered, portable ventilating fan. Wheels easily. Will draw smoke, dust, gasses from area or supply fresh, cooling air. Ask for latest bulletin PW. The Herman Nelson Corp., Moline, Ill.

### Roof Maintenance

538. Roof Maintenance Guide is the name of a new publication intended to help you find the best way of dealing with leaky roofs. It's free, from Stonhard Company, 883 Terminal Commerce Bldg., Philadelphia 8, Pa.

## SNOW FIGHTING

### For High-Speed Snow Removal

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Frink Sno-Plows, Inc., Clayton, 1000 Islands, N. Y.

### Fast, Efficient Skid-Proofing

355. Get full facts about Baughman Light-Weight Cinder Spreaders, fast operators for cinders, sand, salt, chips, etc. Free flowing at low temperatures. 9-17 cu. yd. cap. Write Dept. P.W., Baughman Mfg. Co., Inc., Jerseyville, Ill.

## STREETS AND HIGHWAYS

### How to Use Less Labor in Resurfacing

15. You can mechanize your resurfacing with these Portable Bituminous Mixers. 6 to 14 ft. sizes for resurfacing and maintenance. Helpful booklet issued by The Jaeger Machine Co., 400 Dublin Avenue, Columbus 16, Ohio.

### Levels Sidewalks and Curbs Quickly and Easily

107. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee 10, Wis.

### How to Build and Maintain Roads With Tarvia

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 illus. Write to The Barrett Div., 40 Rector St., New York 6, N. Y.

### Speed Your Work With These Powerful Motor Graders

128. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

### Strong, Speedy, Low-Cost Maintainer Has Many Uses

130. BG Maintainer, a powerful speedy, low-priced machine for light road maintenance. Full details in illustrated folder. Huber Mfg. Co., Dept. P.W., Marion, Ohio.

### Tandem, 3 Wheel and 3 Axle Road Rollers

138. "The Buffalo-Springfield" line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog P.W. issued by the Buffalo-Springfield Roller Co., Springfield, Ohio.

### Here's a Roller for Every Need

141. Three-Wheel and Tandem Rollers, 5 to 8-ton and 10 & 12 ton sizes: also variable weight tandem roller for new highway surfacing and old road conditioning. Ask for new bulletin. Dept. P.W., Huber Mfg. Co., Marion, Ohio.

### Want High-Service Low-Cost Roads?

150. "High-Service, Low Cost Roads" sets forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated, 34 pages. Sent by Solvay Sales Corp., Dept. P.W., 40 Rector St., New York 6, N. Y.

### Mix-in Place Roadbuilders Save on Scarce Labor

187. Mix-in Place Roadbuilders. Bituminous Pavers, Concrete Bituminous Finishers. Adjustable Spreaders, Forms, etc. —4 complete catalogs in one cover, issued by the Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

### Here's Your Diesel Tractor!

190. Big 48 page catalog describes and lists many uses for International Diesel Tractors. Write International Harvester Co., Dept. P.W., 180 North Michigan Ave., Chicago 1, Ill.

### Latest Maintenance Equipment For Blacktop Roads

290. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

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### Non-Corrosive, Long Lasting Low Cost of Sewer Pipe

72. Get this new engineering data on clay pipe for sewers. Withstands acid, alkali and gas attacks indefinitely. Cuts maintenance costs to a minimum. Write Dept. P.W., National Clay Pipe Mfrs., 111 W. Washington St., Chicago 2, Ill.

### Does Air Sabotage Your Pipe Lines and Pumps?

357. Automatic Air Release Valves for water, sewage and industrial uses automatically vent air accumulations. Ask for latest illustrated engineering bulletins. Simpex Valve & Meter Co., 6750 Upland St., Philadelphia 42, Pa.

### Valuable Booklet on Porous Diffuser Plates and Tubes

367. A valuable booklet on porous di fuser plates and tubes for sewage trea ment plants. Covers permeability, porosit pore size and pressure loss data, wi curves. Also information on installation with sketches and pictures, specification methods of cleaning and studies in perme ability, 20 pp. illustrated. Write to Norto Company, Dept. P.W., Worcester 6, Mas

### How You Can Clean Sewers From Streets Easily and Inexpensively

386. 32-page illustrated booklet ex plains how a city can clean its sewers an culverts with its own forces using the up to-date Flexible Sewer Rod equipmen Illustrates and describes all necessar equipment. Issued by Flexible Sewer Ro Equipment Co., 9059 Venice Boulevard, Lo Angeles 34, Calif.

### How Cities Can Do Complete Sewer Cleaning From Street

387. Literature illustrating how cities towns and villages using OK Champio Sewer Cleaners are doing a complete sewe cleaning job from street level. Three size of machines available in addition to fu line of sewer rods and accessories. Issue by Champion Corporation, 4752 Sheffiel Avenue, Hammond, Indiana.

### All About Flow Meters

409. The primary devices for flo measurement—the orifice, the pitot tub the venturi meter and others—and th application to them of the Simplex mete are described in a useful 24-page booki (No. 300). Simplex Valve and Meter Co 6750 Upland St., Philadelphia 42, Pa.

### Make Low-Cost Electricity From Cheap Fuel

422. New booklet describes Sheppar Diesel Generating Sets that make low co electricity from cheap fuel and give de pendable service in the hands of any aver age operator. Write R. H. Sheppard Co 250 Middle St., Hanover, Pa.

### How to Select Main Line Meters

432. New bulletin illustrates Builder Air Relay system for liquids containin suspended solids like sewage. Eliminat corrosion, clogged pipes, etc. "The Selec tion of Main Line Meters," a highly in formative and useful presentation, de scribes forms of differential producers an quickly solves typical problems with th use of graphic charts. Write Builders Providence, Inc., Dept. P.W., 9 Codding St Providence 1, R. I.

### How to Make Better Sewer Pipe Joints

447. How to make a better sewer pip joint of cement—tight, minimizing root in trusion, better alignment of joint. Permit making joints in water-bearing trenches General instructions issued by L. A Weston, Dept. P.W., Adams, Mass.

### Save Trucks and Labor In City Rubbish Collection

459. For saving trucks, labor, and time in city rubbish collection get detail of the new Dumpster-Kolector describe in literature just published by Dempste Brothers, Inc., 996 Higgins, Knoxville 1 Tenn.

### How to Get Automatic Removal of Screenings

460. Be assured of uninterrupted, con stant automatic removal of screening Folder 1587 tells how. Gives some of th outstanding advantages of "Straightlin Bar Screens" (Vertical and incline types). Link-Belt Co., Dept. P.W., 2045 W Hunting Park Ave., Philadelphia 40, Pa.

### An Incinerator Necessity

463. Recuperator tubes made fro Silicon Carbide and "Fireclay" Corebus ers for maximum efficiency are describe and illustrated in bulletin No. 11 issued b Fitch Recuperator Co., Dept. P.W., Plain field National Bank Bldg., Plainfield, N.

### How You Can Dispose Of Sewage Solids

464. Nichols Herreshoff incinerator fo complete disposal of sewage solids and in dustrial wastes—a new booklet illustrate and explains how this Nichols incinerato works. Pictures recent installations. Wri


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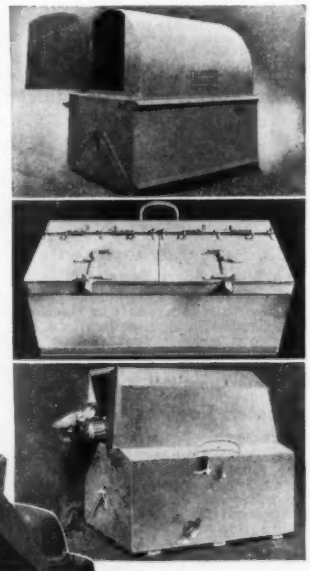

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469. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., Dept. P.W., 4241 Ravenswood Ave., Chicago 13, Ill.

### Useful Design Data on Sedimentation Tanks

482. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, Dept. P.W., 570 Lexington Ave., New York 22, N. Y.

### Packaged Sewage Treatment— Just Right for Small Places

488. "Packaged" Sewage Treatment Plants specifically developed for small communities — 100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

### Look Into This Sewage Treatment Equipment

490. New bulletin P.W. fully describes and illustrates Hardinge sludge collectors for clarifiers, sludge concentration and skimming in both circular and rectangular tanks. Write Dept. P.W., Hardinge Company, Inc., York, Pa.

### Glazed Clay Blocks for Trickling Filter Underdrains

492. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburg 12, Pa., for free copy.

### How to Use Alum for Coagulation

502. Alum for coagulation in both sewage and water plants is the subject of literature now available from Dept. P.W., General Chemical Company, 40 Rector St., New York 6, N. Y.

### Engineering Details of Armcre Filter Blocks

525. Engineering bulletin shows construction details of Armcre Filter Bottom Blocks for better trickling filter results. Tells how Armcre blocks meet all requirements. Write to Ayer-McCarel-Reagan Clay Co., Brazil, Ind.

### For Completely Successful Trickling Filter Systems

526. Armcre Filter Bottom Blocks by BOSCO. 12-page illustrated booklet explains how Armcre blocks meet every requirement for successful trickling filter operation. Gives full specifications and construction details. Includes use for Bio-Filtration. Write Bowerston Shale Co., Bowerston, Ohio.

### One-Unit and Two-Unit Vitrified Floor Systems

527. Metro one-unit and two-unit vitrified clay blocks for trickling filter floors are described in illustrated catalog. Includes construction drawings, pictures and complete specifications. Ask for your copy today. The Metropolitan Paving Brick Co., Canton, Ohio.

### All About Translot Filter Bottom Blocks

528. Illustrated Engineering Bulletin gives full data about Translot Filter Blocks for Trickling Filters. Shows typical sections, installation views, etc. Write Cannelton Sewer Pipe Co., Cannelton, Ind.

### For All Sludge Dewatering

601. The first filters to be used in large scale operation on primary, elutriated and Guggenheim sludges. Ask for latest engineering Bulletin P.W. General American Process Equipment Div., 10 E 49th St., New York, N. Y.


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USE COUPON ON PAGE 65

### Low Cost Air for Sewage Disposal

602. All interested in low cost air for sewage disposal will want a copy of this useful booklet. Describes operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

### Biofiltration for Economical Secondary Treatment

605. Biofiltration means lower first cost of filters, control of recirculation rates, less operating personnel, no fly and odor nuisance. Get all details in bulletin PW today from the Jeffrey Mfg. Co., 947-99 No. Fourth St., Columbus 16, Ohio.

## WATER WORKS

### Do Your Water Mains Need Cleaning?

388. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

### For All Water Tank Maintenance Troubles

389. For all water tank maintenance troubles, whether the need is for repairs, painting, welding, or cleaning, get latest literature of Chicago Tank and Bridge Co., 618 Empire Bldg., Rockford, Ill.

### Solve Corrosion Problems With This Special Alloy

391. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

### To Measure, Mix, Feed Chlorine or Other Gases

397. Everson SterElators. Bulletins 1063, 1066, 708 and others describe this device for measuring, mixing and feeding chlorine or other gases in solution. Capacities range from ¼ lb. to 2,000 lb. of gas per 24 hours. Address: Everson Manufacturing Co., 214 W. Huron St., Chicago 10, Ill.

### Make Water Extra Safe

399. Safe water may be one of the civic improvements your citizens expect soon. Feeders of all types including Hypochlorinators, Reagent Feeders, Dry Chemical Feeders, Chlorinators and Ammoniators for feeding all of the usual chemicals used in sanitation practice. Ask for latest catalogs. Dept. P.W., Wallace & Tiernan Co., Newark 1, N. J.

### Chem-O-Feeders for Automatic Chemical Feeding

400. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. %, 96 Codding St., Providence 1, R. I.

### All Kinds of Valves And Hydrants

407. Hydrants and Valves. Catalog P. W. covers fire protection appliances, including hydrants, gates and check valves. Catalog also describes sluice gates, shear gates, and flap, mud, gate, check and foot valves. Address: Mueller Company, Chattanooga, Tenn.

### All Types of Valves, Hydrants And Fittings

413. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Aniston, Ala.

### Complete Data on Gates, Valves, Hydrants

414. Gate Valves. Double disc bronze mounted, sizes 2" to 72", hand, hydraulic, electric or pneumatic operating, rising or non-rising stem. Bulletin X. Address: Rensselaer Valve Co., Troy, N. Y.


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Handles any loose material . . . Job to Job at truck speeds. Loads two to three tons per minute.

*Write for Bulletin PW-67*

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GALION OHIO


USE COUPON ON PAGE 65

### 88 Page Book Helps Solve Water Problems

423. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 88-page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

### It's Easy to Use This Leak Locator

426. Leak Locators. Again available to waterworks superintendents, the Globe line of leak locators, dipping needles and pipe finders. Several leaflets describing the original Geophone leak locator, Little Wonder pipe phone, and the Magnetite Dipping Needle. Globe Phone Mfg. Corp., Dept. P., Reading, Mass.

### Need Street, Sewer or Water Castings?

429. Streets, sewer and water castings in various styles, sizes and weights. Manhole covers and steps, inlets and gratings, water meter covers, cistern and coal hole covers, gutter crossing plates, valve and lamphole covers, etc. Described in catalog PW issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

### What You Should Know About Meter Setting and Testing Equipment

431. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet P.W. you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

### Cast Iron Pipe and Fittings For Every Need

437. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. P.W., Burlington, N. J.

### Do You Have This Data On Cast Iron Pipe?

438. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., Dept. P.W., Public Ledger Building, Independence Square, Philadelphia 5, Pa.

### How to Make Concrete Pipe on the Job

440. Making concrete pipe on the job to give employment at home is the subject of a booklet sent on request by Quinn Wire & Iron Works, 1621 12th St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms.

### Concrete Pipe With Greater Elasticity

442. Lock Joint Reinforced Concrete Sewer Pipe, Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

### Makes Underground Pipe Installations Easy

444. One-man-operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117. Greenlee Tool Co., 2042 Columbia Ave., Rockford, Ill.

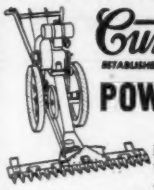
### Interesting Facts About Transite Pipe

445. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., Dept. P.W., 22 East 40th St., New York 16, N. Y.

### Need a Water-Tight Pipe Joint?

449. Full information on "Hydro-Tite" jointing compound for bell and spigot pipe, together with specifications, instructions, and illustrations both on it and "Fibrex" sanitary joint packing are contained in

CUT THE CORNERS WITH THE



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WATER PURITY TESTS
*now a*
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handsome 48-page booklet. Address: Hydraulic Development Corp., Dept. P.W., 50 Church St., New York.

### How to Estimate Quantity Of Joint Compound Needed

450. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

### Data on High Efficiency Well Water Systems

454. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklet P.W., Adv. Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis 8, Tenn.

### Here's Data on All Kinds of Pumps

458. Performance data and illustrations on all kinds of pumps for all uses. Address: Dept. P.W., American Well Works, Aurora, Ill.

### Want Clear, Soft, Iron-Free Water?

467. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in this interesting technical booklet. Permutit Co., Dept. P.W., 330 W. 42nd St., New York 18, N. Y.

### Are You Thinking About A Swimming Pool?

472. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data, prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

### Eliminate Taste and Odor From Your Water

474. Technical pub. No. P.W. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination. Sent free to any operator requesting it.

### Have You a Water Conditioning Problem?

481. Installation-tested equipment for complete municipal and industrial systems or individual units. Illustrated and described in latest booklets from Dept. P.W., American Wells Works, Aurora, Ill.

### Treating Water With Copper Sulphate

496. "Use of copper sulphate in water treatment plants" contains valuable data on chemicals, dosage, etc. Ferri-floc Ferric Sulphate—a new, valuable booklet P.W. on coagulation for water and sewage treatment plants. Write Tennessee Corporation, Atlanta 1, Ga.

### How to Stabilize Lime Softened Water

498. Engineering Bulletin describes stabilizing lime-softened water by recarbonation, discusses gas production, washing, compressing, drying, and applying the CO (2). Infilco, Inc., 325 West 25th Place, Chicago 16, Ill.

### Outdoor Water Service Devices That Do Not Freeze

506. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., contained in Catalog L. Sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio.

### Here's Data on All Swimming Pool Needs

508. Well illustrated bulletin describes Filters, Water Softeners, Hydrogen Ion Plants and Complete Equipment for Swimming pools, etc. Copy sent on request by Dept. PW., Chemical Equipment Co., 223 Center Street, Los Angeles 54, Calif.

USE COUPON ON PAGE 65

LEAKY ROOF?

Playing catch with roof leaks is always a losing game . . . the score quickly adds up in wasted time as well as damage to your building, machinery and goods.

Don't put up with the high cost of roof leaks in your plant . . . have your handy man repair your roof with **Stonhard Roof Resurfacer.**

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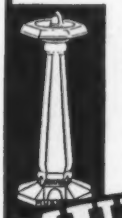

Look for the full name on Hydrants, Drinking Fountains and Street Washers. It identifies the "Genuine."

**The Murdock Mfg. & Supply Co.**

Cincinnati 2, Ohio

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SELF CLOSING ANTI-FREEZING HYDRANT

ANTI-FREEZING COMPRESSION HYDRANT

LARGE ANTI-FREEZING HYDRANTS 1½" TO 2" INCLUSIVE



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# GEOPHONE

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A GEOPHONE saves the cost of locating leaks—of surveys, excavating, replacing. A big paying investment for water and sewerage departments. Outfit complete with two GEOPHONES, connecting tubes, earphones, in heavy leather carrying case with shoulder straps. ..... **$75.00**

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## JOB WANTED

Sanitary engineer desires position, 5 years experience in general sanitation and waste disposal. M. S. Degree in Sanitary Engineering. Age 29. Veteran. Write Box 103, c/o Public Works Magazine.

## JOBS FOR ENGINEERS

The War Dep't needs a number of sanitary engineers to serve with the Eighth Army in Japan. Work includes supervision of insect and rodent control, some epidemiology, inspection of civilian water works and waste disposal installations, with necessary recommendations; and other duties. Must be an engineering graduate with at least one year of experience in the above work. Should be unmarried, 30-45; must be willing to serve in isolated areas; physically good condition necessary; and military or administrative experience. P-4 rating, $4902 plus 25%, total salary $6127.50. Write Major D. Donald Klous, Personnel & Training Branch, Civil Affairs Division, War Dep't, Washington, D. C., sending personal history statements.

The U. S. Public Health Service will hold examinations in June for appointment of engineers to the regular corps. About 10 appointments will be made for sanitary engineers and six for other branches of engineering. Grades correspond to 1st Lt. and Captain; there is no discrimination in promotion to grade of full colonel, with same retirement provisions as in Army or Navy. Suitable degree and experience required. Examinations are competitive. Write Surgeon General, U. S. Public Health Service, Washington, D. C.

### Fredrick Storrer Opens Consulting Office

Fredrick R. Storrer has resigned his position as city engineer of Dearborn, Mich., after 22 years of service with the city, 17 of them as city engineer, and has opened an office as a consultant in general municipal work, land improvement and land planning. His address is 23919 Michigan Ave., Dearborn, Mich.

### Personnel Changes

George L. Fox is the new sales manager of the Rusta Restor Division, Johnston & Jennings Co., Cleveland, O.

Ray W. Keeler has been added to the engineering staff of Huber Mfg. Co., Marion, O., which company is using assembiy line methods to speed the production of its maintainers in its new factory building.

Frank P. MacDonald has been appointed sales manager of the Electro Rust-Proofing Corp., Belleville, N. J.

William J. Hazeltine has joined the Galion Iron Works & Mfg. Co., Galion, O., as special representative of the Roller Division.

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# Comminutors are Standard Equipment for Screening and Cutting Sewage Solids

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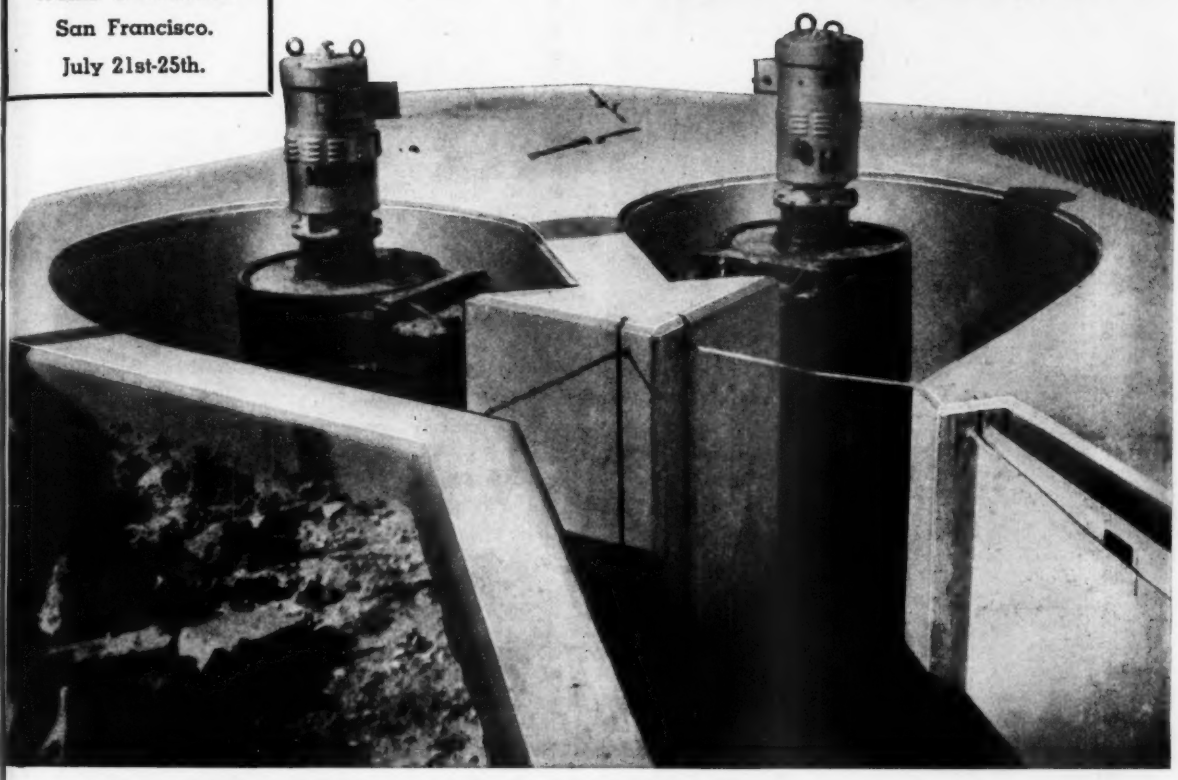

- It cuts sewage solids into small particles that will pass through the drum slots.
- Scientifically designed and engineered — close tolerances insure shearing of rags and stringy material.
- Stellite cutting edges provide long, abrasion-resistant life.
- Comminuted particles settle rapidly . . . improve sedimentation and sludge digestion.
- Labor costs reduced . . . no raking, removal, hauling, burial or incineration of foul screenings.
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- Comminutors in operation continuously for more than fifteen years, establish their dependability. More than 1500 installations to date.

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JULY, 1947

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The New Odorless Sanitary Cleaner makes the Sanitary Service Operator's job an easy, pleasant and profitable one. Compare the following performance with that of old fashioned, disagreeable and unsanitary methods:

Septic Tanks of 500 gal. size cleaned in 15 minutes; 1000 gal. size in 20 minutes. A 25,000 gal. septic tank was actually cleaned in just 10 hours. Efficient? Yes, but also odorless and sanitary. No open tanks, diaphragm hand pumps, shovels or makeshift equipment. Approved by public health officials.

The O. S. C. is a modern apparatus especially engineered for cleaning septic tanks, vaults and cisterns. It can also be used for emergency fire fighting, sprinkling or dewatering flooded basements. It is equipped with a powerful Gorman-Rupp Centrifugal sewage pump of self-priming design and is shipped ready to mount on standard truck chassis of 158 to 161 inches.

*Write for special bulletin 7-ST-11*

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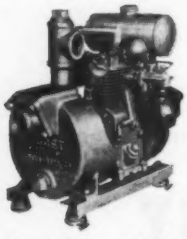
A tiny pump weighing only 27 lbs., remarkable for performance. Fitted with pipe or common garden hose, this pump will lift up to 25 ft. Delivers 8 GPM at 40 lbs. pressure. Electric motor driven – self-priming. An extremely handy, dependable and trouble-free pump for all kinds of pumping jobs.



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The ideal, lightweight, self-priming pump. Easily handled – weighs only 60 lbs. Will pump 3000 GPH at 20 ft. head, 5 ft. suction lift. Rapid automatic priming. Husky – trouble free – non-clogging. Whatever your pumping requirements may be up to 125,000 GPH there is a Gorman-Rupp Blue pump to do the job quicker and better.

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